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AN ECONOMIC ANALYSIS OF THE PUBLIC-UTILITY AND AREA-PRICE METHODS OF FEDERAL REGULATION OF THE INDEPENDENT PRODUCERS OF NATURAL GAS

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CHAPTER I

REGULATION OF THE FIELD SALES OF NATURAL GAS AS AN ISSUE IN PUBLIC POLICY FORMATION

The Supreme Court in 1954 decided that the field sales of gas for resale in interstate commerce by independent producers of natural gas were under the jurisdiction of the Federal Power Commission.[1] That decision set in motion the search for a method of regulating these gas sales in a satisfactory way. This search was still in progress at the end of 1962, over eight years later. The process of policy formation in the intervening period had offered an absorbing study in government regulation of industry. The development of the regulation of independent producers of natural gas was especially interesting because it came during a period of relative stability in government-business relations.

The issues in government regulation of industry which had excited public and academic interest in the prewar period had been mostly settled by the end of World War II. Public-utility regulation had become somewhat standardized. The Supreme Court decision in the Hope Natural Gas Company case disposed of the last major policy issue in 1944 by settling the question of the value of the investment upon which return was to be earned.[2] The reforms of the New Deal period had brought the stock market,

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[1] Phillips Petroleum Company v. Wisconsin, 347 U.S. 672 (1954). (Hereinafter referred to as the Phillips case.)

[2] Federal Power Commission v. Hope Natural Gas Company, 320 U.S. 591 (1944). (Hereinafter referred to as the Hope case.)

utility holding companies, commercial and investment banking industries, the aviation industry and business advertising and competitive practices under the surveillance of government. The regulatory agencies were for the most part established and settled in their operations by this time. Administrative problems abounded, but policies were generally understood and accepted.

The rapid development of the natural gas industry following World War II created problems in policy formulation which were distinctly different from the traditional concerns of regulation. Determination of the appropriate price for natural gas in the field was a new departure for regulation. The public policies toward business activity current when the regulation of the gas industry was initiated generally were formulated with either the problem of monopoly or of the special relationships of an industry affected with the public interest in mind. The frame of reference with which gas field price regulation was first approached reflected these same points of departure. Yet, along with the matter of income distribution, regulation of the gas production industry required decisions on the allocation of the depleting quantity of gas both over time and among alternative uses. These extended effects of public policy action were not reflected in most of the literature on gas field sales regulation.

Studies of the field market for natural gas have been highly selective and with few exceptions have been limited to traditional regulatory issues. Considerable legal research has centered on whether the FPC had authority under the Natural Gas Act to control the independent producers of natural gas. The income distribution effects of rising gas prices in the field and the direct control of the end use of gas have been studied by interested groups. The adequacy of present and potential supplies of natural gas has been explored. Various specific problems in application of particular regulatory methods have been examined. Most of the economic studies undertaken have emphasized specific problems, such as the extent of competition at the field sales level and the adequacy of specified rates to fulfill the criteria of public utility regulation. While these studies of gas regulation have contributed to

the understanding of industry problems, they have not provided a base from which conclusions on field sales regulation can be drawn.

The Federal Power Commission, including both the Commissioners and the Staff, has examined gas field price issues both in the more general Natural Gas Investigation and in connection with specific cases. The Natural Gas Investigation was limited to issues which existed or were in prospect during the early postwar period. As a result, the problems of the rapidly expanding postwar industry were cast in terms of an extension of the prewar industry with its different problems and its different economic organization. The specific rate cases considered by the Commission were limited both in subject matter and in frame of reference. The problem of regulating a given company was not approached from the level of appropriate policy for an entire industry, hence no industry policy has evolved from the regulatory process. Despite the magnitude of the regulatory efforts, then, the basic issues in natural gas field price regulation had not been adequately treated, nor had a satisfactory policy been enunciated, by the end of 1962. One of the major purposes of this work is to provide an analytical framework capable of examining the issues in gas field sales regulation so that social goals can be formulated and alternative methods of attaining those goals evaluated.

The Administration of Regulation

The Federal Power Commission is the independent regulatory commission assigned the task of administering the Natural Gas Act, the legislation under which federal regulation of the natural gas industry is authorized.[3] The FPC, under the applicable statutes, is the administrative link between the Congress and the natural gas industry.[4] Most natural gas regulation on the federal level, including both transportation and field sales for resale, must pass through the FPC machinery.

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[3] 52 Stat. 821 (1938); 15 U. S. C. 717-717 w. (Hereinafter referred to as the Natural Gas Act.)

[4] For sake of brevity the Federal Power Commission will frequently be referred to as the FPC.

The independent regulatory commission has been exposed to a re-evaluation during the postwar period. This administrative device was originally conceived of as a means of joining the benefits of expert knowledge of particular aspects of a regulated industry with social control under strict legislative mandate. The complexity of regulation, the absence of clear-cut goals, and the dynamic nature of the industries regulated have more and more forced the regulatory commissions into policy making, as well as administrative, roles. The refusal to recognize the existence of these disparate roles has been blamed, along with the growth in the regulatory task, for the breakdown of regulation that some critics have charged has typified the operations of the commissions during the last decade. The experience of the FPC is instructive in this regard.

The FPC was established to regulate water power site development. Its tasks were first enlarged to include regulation of interstate transmission of electric energy. In 1938 the control over interstate gas transmission was added. In the postwar period the FPC was required to exercise jurisdiction over some field sales of natural gas as well as over the greatly expanded gas transmission industry. These later expansions of authority came under the same basic legislative and administrative machinery set up in 1938. Other commissions have experienced similar expansions of responsibility and economic shifts in the industries regulated. Whether or not the commission device as originally conceived was suited to its earlier role, the changes in operations and scope which have come since the establishment of the regulatory agencies in their present form have made the need for a reappraisal of their adequacy apparent. The record of performance similarly reflects the need for a close examination of individual commissions. The FPC is particularly well suited for such a study because, as Dean Landis stated in his study of the regulatory commissions for President-elect Kennedy,[5] "the Federal

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[5]U.S., Congress, Senate, Committee on the Judiciary, Subcommittee on Administrative Practice and Procedure, Report on Regulatory Agencies to the President-Elect, Prepared by James M. Landis, 86th Cong., 2d Sess., 1960, p. 54.

Power Commission without question represents the outstanding example in the Federal Government of the breakdown of the administrative process. The complexity of its problems is no answer to its more than patent failures."

The FPC and Gas Field Sales Regulation

The choice of the FPC regulation of the gas industry as a case study in regulation by independent regulatory commissions was motivated by factors relating both to the gas industry and to the problems inherent in its regulation. The industry, first of all, is strategic and of great economic significance. Moreover, the great growth in the industry during the postwar period increased its sensitivity to regulation and magnified any resulting effects. Regulation of the natural gas industry at the field sales level was also highly controversial. Policy disagreements led to preparation and presentation of considerable information and public comment, though much of it, as mentioned above, was of little analytical value or interest. The unsettled nature of public policy in this area, in the proximate political sense as well as within the more idealized economic framework, lent timeliness to the study which added to its interest to the writer. The presence of unusual regulatory problems in the regulation of the field price of natural gas was the final element leading to the choice of this aspect of the natural gas industry for further study. The comments below illuminate the importance of the natural gas industry in the economy and the factors which set regulation of this industry somewhat apart.

The place of the natural gas industry in the economy of the United States

The natural gas industry in 1962 was the sixth largest industry in the United States.[6] In 1960, consumers of all types paid a total of almost $6.3 billion for natural gas. At the wellhead this gas brought

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[6]Federal Power Commission, Forty-Second Annual Report, 1962 (Washington: U.S. Government Printing Office, 1963), p. 1.

almost $1.8 billion, with the other $4.5 billion going for payments for the service of conveying the gas from the seat of production and making it available for ultimate consumption.[7] The total marketed production of natural gas in 1960 was 12,771.0 billion cubic feet.[8] Preliminary figures for 1961 and 1962 showed 13,037.6 and 13,525.0 billion cubic feet produced, respectively.[9] The proportion of energy consumed in the United States coming from natural gas has increased steadily along with the increase in the absolute quantities of gas consumed. Gas supplied 9.3 per cent of the energy used in 1933, 13.7 per cent in 1945, and 26.8 per cent in 1954. In 1960, approximately one-third of all energy used in this country was supplied by the gas industry.[10]

The position of the natural gas industry in consumer income expenditures has also risen over the years, with the greatest growth in the period immediately following World War II. In 1933 the total expenditure on natural gas by consumers was only $368 million. Total purchases reached $835 million in the last war year of 1945, and by 1960 were seven and one-half times as high as they were in 1945.[11] Volume of marketed production increased as well, with gas put to productive use or lost rising from 1,555.5 billion cubic feet in 1933 to 3,917.7 billion cubic feet in 1945. Continuing this growth, gas marketings more than tripled between the end of World War II and 1962.[12] One rough measure of the

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[7]Data taken from Table A in the Appendix.

[8]Data taken from Table B in the Appendix.

[9]"Natural gas had best year ever," Oil and Gas Journal, LXIX, No. 4 (January 28, 1963), p. 168.

[10]Data for 1933-1954 taken from American Gas Association, Historical Statistics of the Gas Industry (New York: American Gas Association, 1954), p. 31; data for 1960 taken from American Gas Association, Gas Facts: A Statistical Record of the Gas Utility Industry in 1960 (New York: American Gas Association, 1961), p. 18. The 1960 figure is preliminary and includes Alaska and Hawaii.

[11]Data taken from Table A in the Appendix.

[12]Data taken from Table B in the Appendix.

relative as well as absolute growth of the natural gas industry is the change in gas sales to consumers as compared to all personal consumption expenditures. Gas sales were approximately .8 per cent as large as personal consumption expenditures in both 1933 and 1938, fell slightly to .7 per cent in 1945, and then rose to 1.3 per cent in 1954 and 1.9 per cent in 1960.[13] While factors other than relative growth of the gas industry influenced this ratio, the general pattern of more than proportionate growth of the gas industry was plain.

The use of natural gas had spread by 1960 until it had reached, though not covered, all the continental states other than Vermont and Maine, as well as Alaska and the District of Columbia.[14] The wide geographic incidence of gas in 1960 contrasted with the earlier years of the industry when gas was consumed only in the immediate vicinity of production because of the economic and technical problems of long distance transmission. Production from other regions had replaced much of the output from depleted small gas fields near population centers by 1960. In recent years gas production has been concentrated in fewer areas. In 1933 only 22 per cent of the gas produced was transported interstate. In 1938, 28 per cent was shipped interstate, and approximately the same proportion went to out-of-state consumers in 1945. The increase in interstate shipments accelerated with the postwar pipeline building boom. In 1954, 53 per cent of the gas was consumed outside its state of origin. By 1960 this figure had increased to 58 per cent.[15]

The shift in geographic distribution of gas sales has been partially responsible for a change in the nature of the end uses to which gas has been put. The increased value of natural gas as a fuel and the ability to transport it to consuming markets some distance from the

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[13]Percentages calculated from gas sales data in Appendix Table A, and Personal Consumption Expenditures data from official published data in the Survey of Current Business and its supplements.

[14]Data taken from Table C in the Appendix.

[15]Percentages calculated from Table B in the Appendix.

producing regions has led to an increase in the proportion of the gas going to domestic consumers and a reduction in the proportion going to field and other industrial uses. In 1933 18 per cent of the gas used was consumed by domestic consumers and 76 per cent by industrial consumers, including uses in the field, flaring, and other waste not included. The relative figures for 1938 and 1945 were 16 per cent for domestic and 79 per cent for industrial uses. In 1954, however, domestic consumption took 23 per cent of all gas consumed while the industrial uses were reduced to 71 per cent of the total, though absolute increases in gas consumption were achieved in every end use except carbon black manufacture. In 1960 the trend evident in 1954 continued. Only 67 per cent of the gas put to productive use was consumed in industrial pursuits, while a high of 25 per cent of such gas went to domestic consumers. The gas not elsewhere classified was consumed in commercial uses.[16] The increase in domestic consumption relative to total consumption is an indication of the general movement toward higher value use for the gas consumed.

The natural gas industry has attained a position of importance in the economy of the United States. Its importance has been growing over the past three decades. The future of the natural gas industry, however, depends on its ability to continue to provide fuel at a reasonable cost. One prerequisite for such production is the availability of undepleted natural gas reserves. Two measures of recoverable natural gas can be used to gain some insight into the industry future, but both of these measures are highly misleading if taken alone. The first of these measures is currently existing proved recoverable reserves and the second is estimates of the total amount of gas which might be recovered over the life of the industry. Reasonably consistent data on recoverable reserves were not available before 1945. In that year it was estimated that 150 trillion cubic feet of proved recoverable gas had not been produced. In 1954, despite continued high level production, the estimate

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[16] Calculated from data presented in Appendix Table D. The commercial classification includes all nonindustrial, nonhousehold uses.

had risen to approximately 210 trillion cubic feet. In 1960 these reserves were set at 265 trillion cubic feet, while preliminary figures for January 1, 1963, showed 285 trillion cubic feet available.[17] One comparison used to relate the proved recoverable reserves to some meaningful measure is the calculation of the life of reserves at current consumption rates. In these terms, in 1962 there were 20.7 years of proved reserves, while in 1954 the similar figure was 25.3 and in 1945 it was 38.5 years.[18]

The outlook for future discovery of natural gas depends, of course, on the quantity of gas actually in place and the success in discovering and producing it. Estimates of total gas in place can only be very rough approximations. Historically such estimates have almost always proved conservative, primarily because of implicit reliance on the state of technology at the time of the estimation. Recent estimates have arrived at figures between 500 trillion cubic feet and 1,000 trillion cubic feet, or approximately 50 to 100 years supply for the amount of gas currently in place and recoverable under the continental United States, including Alaska.[19]

Special factors in natural gas industry regulation

Two matters affecting the natural gas industry caused a study of its regulation to be of particular interest and value. The first of

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[17] Data taken from Appendix Table B; for 1963, Oil and Gas Journal, LXIX, No. 4, p. 169.

[18] Calculated from Appendix Table B; for 1962, Ibid. These data are subject to misinterpretation for one reason beyond the obvious fact that life rates are based on present consumption levels and no new discovery of gas. This reason is that reservoir deliverability falls more rapidly than do reserves. Therefore the total present proved reserves could not be produced at the current consumption rate for the full life of the reserves because some of the fields will not be able to produce at this rate, though the quantity indicated can be produced given enough time.

[19] Bruce C. Netschert, The Future Supply of Oil and Gas (Baltimore: The Johns Hopkins Press, for Resources for the Future, 1958), pp. 64-74.

these was the problem of appropriate use rates, made necessary because natural gas is depleted in use, and the second was the time lag between adjustments which created a wider than usual wedge between short run and long run effects of regulation induced changes.

The total quantity of natural gas that existed at the time of the first intended production of the substance has been reduced and cannot be replenished in the same form by human action. The use and development rates of gas over time are both partially, and at least permissively, the products of government action in the regulatory sphere. This additional dimension of the resource allocation problem, the allocation of an unknown total quantity of a resource available at an undeterminable expense over an uncertain period of time, brings exotic considerations into play. The usual economic framework is stretched, and in the process its more common applications are potentially made more meaningful.

A large portion of the investment in the natural gas industry, on every level from production to consumption, is highly immobile. Exploration and development expenditures, the actual producing wells, the transportation and distribution networks, and the gas using facilities all are more or less fixed geographically and have few if any alternative uses. The average technical life of these installations is long. Consequently, changes in decision variables, such as price, can bring large changes in the total industry complex only after the passage of considerable time. The immediate effect of any regulatory change would likely, then, be quite small, and perhaps even contrary to the ultimate result. For this reason industry regulation creates possible tension between the long and short run goals sought. In analytical terms, the short run can proceed from varied special conditions, and therefore prediction of short run results requires special knowledge of existing conditions. For the long run, however, the important factor is the tendency toward equilibrium set up by the industry-regulatory relations. This tendency can be predicted with greater reliability than can the short run effect. On the other hand, the longer time period increases the possibility that exterior changes could alter the otherwise

reasonable ceteris paribus assumptions and upset particular predictions. These time period problems are heightened in the natural gas industry, and consequently can be considered and in some instances analyzed with greater ease here than in other industries. From this review of the special industry and regulatory factors involved, it can be seen that FPC jurisdiction over the field sales of natural gas for resale in interstate commerce introduced challenging issues in government regulation.[20]

An Analytical Approach to the Federal Regulation of the Independent Producers of Natural Gas

The issue raised in this study is whether different methods of federal regulation of the field sale for resale of natural gas in interstate commerce can be evaluated on the basis of attainment of specified public policy goals. Certain goals are posited and alternative regulatory methods are evaluated on grounds of gross consistency with the goals selected. The evaluation requires an explicit formulation of both the policies considered and the goals sought. The requirement of a formal statement of goals and approaches is expected to result in a clearer expression of the choices in gas industry regulation. Further, if meaningful conclusions can be reached on the relative desirability of different methods of control, then the applicability of the analytical approach to at least one public policy issue will be demonstrated.

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[20]"Government regulation" in this study will be used as a general term signifying any government action which is intended to alter economic relations. Its choice over alternative terms such as "government interference" or "government control" or "government direction" was made on the basis of relative neutrality and comprehensiveness. The term is used as an approximate antonym of laissez faire and not of anarchy. Therefore the absence of "government regulation" presumes the maintenance of the general duties of government including the enforcement of contracts, the protection of private property and the maintenance of law and order. "Public policy" or "government policy" is a more comprehensive term which includes government regulation as well as a policy of laissez faire. It presumes a thought-out position as contrasted to absence of position.

Alternative regulatory methods already under public discussion were chosen for comparison in this study. They were more easily compared than others, possibly synthetically created by the investigator, because formulated values, administrative techniques, and accepted orderings of experience already existed. Furthermore, the usefulness of the investigation was enhanced by the choice of recognized approaches to regulation because they could be tested for structural consistency and usefulness at the same time that the rest of the investigation proceeded toward its more immediate purpose. It does not follow, however, that the alternative regulatory methods used in this study are necessarily identical to the public interpretation of methods going by the same name. Such identity is not verifiable or meaningful, nor is it necessary for the generation of useful conclusions. The positions presented are explained in detail so that the reader can adjust the results obtained to fit the desired particular variant of the regulatory approach.

Three regulatory approaches were selected for direct study and evaluation in this work. One of these policies, no direct regulation of the field price of natural gas sold by independent producers, was considered implicitly through descriptions of preregulation conditions and through comparisons of the other policies with laissez faire. The direct regulation methods considered were the public-utility and the area-price approaches to field price determination. The agency charged with the actual regulation of the natural gas industry on the federal level, the FPC, had experience in using both these approaches. The present study drew on this experience for both analytical and factual material.

Goals Selected for Evaluation of Alternative Public Policies Toward Gas Field Sales

The values or goals which were selected as bases for evaluating possible government regulation of the sales of natural gas in the field were chosen because of their meaningfulness in United States public policy discussion in the mid-Twentieth century.[21] Obviously these values cannot

[21] The goals of regulatory policy selected for this study are considered in detail in Chapter VI below.

be judged in terms of "correctness." Such judgments are not possible on anything other than an a priori basis which would be irrelevant in the current context. Further, the writer makes no claim that the values selected were the most common, prevalent, generally accepted, or even most prominent values in the United States. Fortunately the matter is not crucial. A demonstration of the ability of analytical techniques to evaluate policy alternatives does not depend on the precise nature of the values chosen, though the values chosen can influence the conclusions reached. The reader, moreover, can substitute other premises and relate the findings of the study to them. The nature of the goals selected and some of the reasons for their selection are noted below.

Maximum economic welfare as a goal in gas field sales regulation

One public policy goal chosen in this study was the goal of maximum economic welfare. Economic welfare was measured by the quantity of economic value produced, value being conceived in private want satisfaction terms defined by voluntary choice of individuals in a market economy. In a verifiable sense, economic welfare maximization was assumed to be equivalent to regulation which would yield the most efficient organization of the natural gas industry. Efficiency was defined as the ratio of value output to the input of scarce resources. The goal of welfare maximization was judged fulfilled when no adjustment could be made in field sales regulation which would increase economic value.

Satisfaction of the goal of economic welfare maximization should not be interpreted as a maximization at the same time of aggregate personal satisfactions. Verification of the attainment of this latter goal requires that individual personal satisfactions be measured and added algebraically to determine which organization and distribution of production would yield the highest total satisfactions. Hence income distribution would play a part in maximizing personal satisfactions but would be ignored in economic welfare maximization determination. Since interpersonal utility comparisons cannot be verified, alterations in aggregate personal satisfactions cannot be demonstrated. No guarantee

that a change bringing mixed gains and losses to a group of individuals would either increase or decrease total group satisfactions is therefore possible. The gains of the gainers might or might not offset the losses of the losers. This absence of measurability therefore renders the result for the group indeterminate.[22] For this reason, regulation to increase aggregate economic welfare has as its determinable limit the position at which to increase the satisfactions of one individual others must suffer a loss. If this condition is not fulfilled, appropriate economic adjustments can increase aggregate economic welfare. It is just this sort of adjustment which comes under the category of promotion of efficiency, a proximate goal leading necessarily to potential increases in economic welfare, though the question of compensation remains.[23]

A public policy of maximizing efficiency of production and consumption in an industry would approximate laissez faire if that industry

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[22]The possibility of compensation is sometimes raised at this point. The reasoning is that if the gainers gain more than the losers lose, the gainers could bribe the losers to agree to a change. While this approach serves to clarify some issues in public policy, it does not solve the problems inherent in making pragmatic choices involving interpersonal utility comparisons. If compensation is paid, then the nominal losers would no longer be losers and would voluntarily agree to the contemplated change. If compensation was not paid, then the voluntarism postulate would be violated. Redistribution would again rest on value judgments and no unambiguous evaluation of it could progress beyond its mere notation. The notion of potential compensation simply pushes the unknown back one step but leaves it unknown still. Since voluntary choice between actual alternatives is the only measure of the effects of a given change on individual welfare, the amount of potential gains compared to the amount of potential losses cannot be established. Therefore compensation which is not actually chosen cannot provide a criterion for comparing the social welfare associated with two alternatives.

[23]The circumscribed nature of this study must be kept in mind. When a wider horizon than regulation of the natural gas industry is viewed, for example, such factors as administrative cost of regulation, noneconomic variables and motives, and external effects in other industries must be considered. While these ceteris paribus assumptions are sometimes maddeningly limiting, they are necessary for consistency and can be widened at the reader's discretion. Later sections of this study make reference to certain of these external factors.

were so organized and so adjusted to the total economy as to fulfill the conditions of pure competition as they are generally defined.[24] No adjustments in resource allocation decisions could result in increases in economic welfare though changes in the distribution of income might increase aggregate personal satisfactions. Of course this limiting case of perfect resource adjustment does not occur in the world of experience faced by policy makers. Similarly, however, regulation is not costless in either economic or noneconomic terms. Hence the reality of policy formulation is oriented to the presence or absence of gross discrepancies between the performance of an industry and the limiting case of maximum welfare. The absence of perfect resource allocation does not automatically require adjusting government regulation, but it is necessary before government regulation can be tenable in pursuing the goal of maximum economic welfare. Economic welfare as a goal must be considered along with other elements of public policy. These other policy goals are described in the paragraphs below.

Appropriate income distribution as a goal in gas field sales regulation

One goal which has motivated regulation of the price of gas sold by independent producers in the field has been the desire to alter the distribution of income resulting from the unregulated operation of the industry. In its essence this goal is not subject to examination in terms of its impact on aggregate personal satisfactions. Yet, public policy cannot avoid the issue of income redistribution because of its uncertain impact on aggregate personal satisfactions. Government action or inaction in field sales regulation necessarily has income distribution effects. The redistribution of income discussed in this study concerns the producing and consuming sectors of the industry, and does not include alteration of personal income distribution.[25] No specific

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[24]The qualification "so adjusted to the total economy" is required because the presence of pure competition in one segment of a non-purely competitive economy could result in less welfare than certain "balancing" impurities would bring.

[25]Only government policies acting through industry relations

study was limited to evaluating various forms of regulation solely on the basis of whether or not the regulation would be effective in achieving the objective of regulatory agency.

The national interest as a goal in gas field sales regulation

Government regulation in the best interests of the nation as an entity does not fit into the individualistic welfare maximization pattern but it has been accepted as a goal of public policy. The national interest referred to here is defined as the conglomerate of values which are considered important on grounds other than current, private want satisfactions measured by market transactions. In other terms, concern with the national interest implies adjustment of the industry to take its external economic effects into account. The example of a necessary adjustment used most frequently in this study is the alteration in the use rate of natural gas. Satisfaction of the national interest in the gas industry is therefore presumed to include an alteration in the otherwise existing use rate of natural gas. The alternative regulatory methods are tested on their ability to bring this alteration about. The direction and magnitude of the alterations desired are not specified in this study in the interest of establishing the general applicability of any results obtained.

The recognition of three distinct goals in government policy toward the natural gas industry points up potential conflicts in regulatory policy. Chapter VI deals with these goals at some length. It also considers the possibility of a resolution of those conflicts in the form of a coordinated social welfare approach. An outline of the plan of the study places these goals and their role in the evaluation of the alternative regulatory methods in more meaningful perspective.

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themselves are considered in this context. Tax policy or expenditure policy of government, where redistribution of income also is envisioned, is ignored here.

The Plan of the Study

The data presented in this study were selected on the basis of their contribution to the purposes outlined above. Within this general framework several aspects of the gas industry and its regulation are examined. Information on the goals selected, and descriptions of the regulatory methods examined, is required before any analytical conclusions can be drawn. Since a subsidiary but important part of this study concerns policy formation in the natural gas industry, the basic information necessary for an understanding of the technology and institutional organization of the industry is also necessary to the purposes of the study. The legal heritage under which the regulation of the natural gas industry has developed is unfamiliar to many economists. Since legal factors play an important part in field sales regulation some explanatory material is included to make some of the arguments more meaningful to the reader. The contents of the individual chapters are indicated below.

Chapter II deals with government regulation of the production of petroleum. Production is defined as the physical process of removing the hydrocarbon from the reservoir. Information on the physical and technical aspects of the discovery, development, and production of petroleum is found in Chapter II. The development of regulation on the physical level is also traced. An understanding of this regulation is important to this study because state regulation provided a reservoir of experience in the social control of petroleum production which has influenced the federal regulation of the sale of gas.

Regulation on three levels of the natural gas industry is considered in Chapter III. Regulation of the distribution of natural gas by the states and localities was the first exercise of social control over the industry. Federal supervision of the interstate transmission of natural gas developed when the states and localities found that extension of control beyond the state boundaries was required for protection of consumers. Jurisdiction over interstate transmission gave the federal regulatory authorities the task of valuing gas produced by

the interstate transporters to their own account. The first regulation of field price was initiated in this way.

Gas is typically transferred from the independent producer to the interstate transmission company under long term contracts. In the absence of government control, the terms of these sales contracts depend on the field market conditions at the time of their negotiation. Chapter IV describes these markets both geographically and economically. It also analyzes the effect of market conditions on the sale of natural gas by independent producers.

FPC jurisdiction over the independent producers of natural gas was based on the same legislation which brought the interstate transporters of natural gas under federal supervision. This jurisdiction was not settled, however, until 1954, some sixteen years after passage of the Natural Gas Act. Important economic and legal developments leading to field price jurisdiction by the FPC are found in Chapter V below. The scope of FPC jurisdiction at the end of 1962 is also explored.

A further discussion of goals of regulation selected for this study is presented in Chapter VI. The later portion of this chapter considers possibilities for joint satisfaction of partially conflicting goals.

The public-utility approach to the regulation of the sales of gas in the field by independent producers is explored in Chapter VII. In this chapter the experience of the FPC with the only full scale independent producer rate case which used the public-utility method is recounted. Some conclusions as to regulatory results are drawn from the experience in this case. Regulation utilizing a generalized public-utility approach for its model is tested in this chapter for consistency with the goals of regulation as posited in Chapter VI.

The area-price method of determining the field price of natural gas produced by independent producers is subjected to the same sort of examination. In Chapter VIII the operation of the area-price method is described and the available experience with it is reported. Most of the chapter is devoted to an analysis of goal satisfying possibilities under

the area-price method. For this purpose the writer has adopted several assumptions about the area-price method as it might be put in practice.

Conclusions resulting from this study of regulatory policy formation are presented in Chapter IX, along with some suggestions for further investigation. In this chapter the operational significance of the two alternative positive methods of regulation is also explored.

CHAPTER II

GOVERNMENT REGULATION OF THE PRODUCTION OF PETROLEUM

Regulation of petroleum production refers to the control, usually exercised by the states, over the physical processes of petroleum production.[1] Production in this sense is distinguished from the sale of the gas. The sale for resale of natural gas in interstate commerce is under the jurisdiction of the federal government. This regulation is discussed in later chapters.

The regulation of the production of all forms of petroleum is considered here although the study itself centers on the regulation of the natural gas industry and especially on the field sales for resale of natural gas in interstate commerce. The close relation among all the hydrocarbons at the production level requires a joint treatment of them. Furthermore, the legal and institutional framework of regulation of petroleum production has developed as a relatively undifferentiated whole.

State control of petroleum production is extensive and intensive. Many state regulatory bodies have the power under existing law to limit the quantity of petroleum to be produced during any given period. Drilling techniques, well equipment requirements, production methods, product ratios, water disposal, minimum price standards, and the allocation of production quotas among various resource owners are among the other powers exercised by some or all of the states.[2] The impact of this wide-ranging

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[1]The term "petroleum" in this study will cover the undifferentiated related substances oil, natural gas, condensate, and natural gas liquids. When differentiation is required it will be clear from the context.

[2]References to these regulatory devices are found in the text below. Minimum price requirements are a form of control over natural gas production, not over commercial sales. The states using the minimum

regulation is transmitted all through the petroleum industry. Any examination of federal regulation of the movement of petroleum to the ultimate consumer must consider the effect of state regulation.

This chapter offers some tentative generalizations about the regulatory process in state control of petroleum production. The presentation is obviously incomplete because a thorough examination of all production regulation would require many volumes. Therefore, the selection of material has been guided by an attempt to include only the most important and the most pervasive forms of regulation. A subsidiary selection criterion was the desire to show the evolution of regulation over time.

The advocates of government regulation in this industry have rejected laissez faire and argued for particular aspects of social control on many grounds. Most of the argument for regulation can be summarized in two contentions, first that regulation is necessary to protect correlative rights and second that it is needed to conserve a wasting resource. The administrative devices used to protect correlative rights and to conserve gas are important to the development of regulation. Similarly, the evolution of regulation was affected by the legal issues raised and by the ensuing judicial review of the social control exerted. For these reasons in sections three and four considerable attention is paid to the legal and institutional elements surrounding regulation. First, however, the nature of the industry must be discussed.

Characteristics of the Industry Leading to Regulation of Petroleum Production

State regulation of the petroleum production industry has arisen because of public rejection of the results of laissez faire. Three somewhat interrelated but distinguishable factors have initiated most of the regulation. These are the private ownership of subsurface mineral rights under the law of capture, the income distribution effects of

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price device require that a minimum price be paid as a precondition to production.

industry technology, and the conservation of petroleum.[3] Each of these elements is discussed below. Certain characteristics which are viewed as leading to regulation are examined. Then the premise of profit maximizing behavior under laissez faire is utilized to artificially create the conditions under which regulation might have developed. Inferred values which might explain the growth of regulation are then noted. Special attention is paid to the necessary conditions of industry organization which would promote economic welfare and distributional equity.

Private Ownership and the Law of Capture

Under common law doctrine, which has been upheld in the courts of the United States, the ownership of the surface of the land extends downward to the center of the earth. Ownership of the rights to land and that positioned on it or under its surface makes property rights clear unless property of value can be separated from the real estate without the owner's consent.[4] In some instances control of the land does not automatically secure the control of significant elements upon or under it. The law of capture was developed to meet this circumstance.

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[3]Conservation in economic terms is the optimum use rate of an economic substance over time. The problem of optimal use rates is complex and not subject to simple solution. The uncertainties of the problem are such that its solution is beyond any but formal resolution. The broader implications of the conservation problem in the natural gas industry are discussed in Chapter VI of this study. A general discussion of resource use and a seminal treatment of the economic meaning of conservation can be found in Erich W. Zimmermann, World Resources and Industries (rev. ed.; New York: Harper & Brothers, 1951).

A recent treatment of conservation in the petroleum production industry is James W. McKie and Stephen L. McDonald, "Petroleum Conservation in Theory and Practice," Quarterly Journal of Economics, LXXVI (February, 1962), p. 98. This article, published after the formulation of this material, is an analysis of conservation regulation in terms of economic efficiency.

[4]The property rights to subsurface minerals can, of course, be divorced from the ownership of the surface of the land. The question at issue is whether the minerals themselves can be removed without the owner's knowledge through operations which do not directly impinge on either the surface of the property or the subsurface regions.

The law of capture, another common law doctrine, referred to wild animals that in their natural wanderings moved from one property to another. Disputes over ownership were settled by ruling that a migrating resource belonged to whomever subdued it to control and took it to his own use. The owner of the land, however, was granted exclusive right of capture upon his property. Wild animals were, therefore, owned only in a presumptive sense. Similar reasoning was called upon in making decisions as to water rights. The ownership of petroleum reserves and drilling rights in the United States has developed from the principles of private subsurface ownership and the law of capture.[5]

The pools in which petroleum is found vary in size and configuration, but except in rare instances do not conform to ownership patterns on the surface of the ground. It is likely, then, that any single pool will underlay land whose ownership rests in several different hands. All owners of a portion of a reservoir have the right to capture petroleum from it. Further, petroleum does not stay in place but is a migratory product which moves toward areas of less pressure. Production from one hole reduces pressure at that point and causes a migration of petroleum toward the well bole. Therefore, there is no necessary correlation between the amount of surface property owned above some pool and the amount of petroleum which can be produced. Though there are variations depending on reservoir structure and type of petroleum, the area

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[5]Two possible interpretations of the ownership doctrines have been utilized in the United States in determining rights to petroleum. The first is that the rule be modified to one whereby no one owns the migratory mineral until it is reduced to capture, but that the owner of the land surface does own the exclusive right to attempt the capture. This is called the qualified ownership doctrine and was originated with Ohio Co. v. Indiana, 177 U.S. 190 (1900). The doctrine of absolute ownership held that the petroleum underlying land belonged to the owner of the land, but that he lost title when the minerals migrated to some other location. Stephens County v. Mid-Kansas Oil and Gas Co., 254 S.W. 290 (Tex. Sup. Ct. 1923) upheld this doctrine. For a further discussion of this issue see Wilmer D. Masterson, Jr., "A Survey of Basic Oil and Gas Law," Fourth Annual Institute on Oil and Gas Law and Taxation (Dallas, Texas: Southwestern Legal Foundation, 1953), pp. 220-22. For a discussion of the rule of capture with cited cases and legal decisions see: W. L. Summers, The Law of Oil and Gas (Kansas City: The Vernon Law Book Company, 1954), I, pars. 62, 63, pp. 154-91.

drained by one well can be very large if enough time is allowed. Private ownership and the law of capture, along with the migratory nature of petroleum, have made drainage from one property to another a major factor in production decisions under laissez faire conditions.

Production decisions contrasted

The effect of drainage under laissez faire was to force individual profit maximizing firms to choose wasteful production alternatives.[6] Conflicts between ownership interests in the petroleum production industry were also generated. The development and operation of an already discovered hypothetical reservoir as a unit (Case A) is contrasted with the operation of the same pool under divided ownership (Case B) to isolate the effect of potential drainage as a decision variable.

The efficient development and operation of an oil pool as a unit by profit maximizing Firm A would require certain information about reservoir structure and drive which could only be acquired by drilling. A few widely spaced wells would provide the physical information needed to make subsequent decisions on economic grounds. Using information derived from drilling, projections of physical production over time would be made for various combinations of well spacing and production periods.[7] Estimates of prices at various future periods would then be applied to the different streams of physical production to yield a series of possible gross income streams depending on physical production and price projections. Similarly, the costs of wells depending on numbers and the costs of production associated with changes in production period and adjusted for expected cost variations would be projected for the possible streams of physical production. This would produce an analogous family of cost of production estimates also over time.[8] The series of streams of gross

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[6]"Waste" in this context is defined as the absence of maximum economic welfare and therefore as inefficient resource use.

[7]Further discussion of the production rate and well pattern sensitive nature of ultimate recovery ratios follows below.

[8]Costs of wells are variable before they have been expended and therefore must be considered to arrive at maximizing decisions. After

incomes are discounted to present values, as are the series of streams of costs of production. The present values of the streams of gross income and streams of costs of production are then compared to determine the combination yielding the highest present net income. Using this procedure the firm could calculate the profit maximizing number of wells to be drilled and optimum rate of production. If the net return calculated were insufficient to attract Firm A, given its alternatives, it might decide not to develop the field. Of course it would produce its exploratory wells so long as they were covering variable costs.

Profit maximizing behavior for Firm B differs significantly from that described above. Ultimate recovery for the reservoir as a whole is irrelevant to Firm B which is paid only for the oil reaching the surface through its wells. Recovery by one firm can either be higher or lower than that justified by the proportion of the petroleum which originally rested under the surface controlled by that firm. Potential drainage, then, is a highly important factor in determining how much petroleum Firm B subdues to ownership. Drainage is not a consideration in a reservoir operated as a unit. Profit maximizing calculations by Firm B would thus involve somewhat different factors than such calculations by Firm A. Hence production decisions in the case of multiple ownership would only coincidentally be the same as those under one owner control. For example, so long as the increase in production from an additional well was greater than the increase in reservoir ultimate recovery accruing to Firm B in the absence of that well, physical production of Firm B would increase with the drilling of more wells and with faster production. Net income from that additional production would depend on prices, costs of drilling the well, and the discount rate to be applied to streams of future income. Firm A, on the other hand, would have to consider total reservoir ultimate recovery, not just that portion reaching the surface through given wells. Optimizing techniques could be used to determine the profit maximizing number of wells to drill in both Case A and Case B.

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the wells are drilled their costs are sunk, and hence ignored in determining production rates. The firm must seek to maximize its net income given the existing conditions, and therefore historical costs will not change its production decisions.

The best production rate could be found in the same way. Since the number of wells and the optimum production rate in Case B would almost certainly differ from that in welfare maximizing Case A, potential drainage could be said to force individual profit maximizing firms to choose wasteful production alternatives.

The description above of the difference in the development and operation of a reservoir under single rather than multiple ownership illustrates the effect on petroleum production of private ownership of subsurface mineral rights along with the law of capture. In the absence of regulation, multiple ownership forces the drilling of extra wells to produce less total petroleum faster as compared to unit development and operation.[9] The multiple owners as a group are left worse off than they would have been had they developed and operated the reservoir as a unit. Since all of the multiple owners could have been made better off while none were made worse off, the conclusion generally drawn is that unrestricted multiple operation of a petroleum reservoir, the modal condition under laissez faire, would reduce economic welfare as compared to unit operation.

Voluntary agreement to limit the number of wells drilled or voluntary unitizing of properties faces sizable difficulties. The greater the proportion of property under restricted production in a pool, the greater the incentive to one producer to violate that restriction. Similarly, the greater the number of persons pooling their properties for operation, the greater the incentive for one producer to operate independently. In the presence of these facts, welfare maximizing operation of a fragmented reservoir realistically required government or other coercion.

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[9]The average producing well in the United States in 1960 had an oil reserve of about 53,000 barrels and produced 12 barrels per day. In Venezuela, under different ownership patterns, the average well had 1.7 million barrels reserve and produced 271 barrels per day. The average well in the Middle East had a reserve of 136.4 million barrels and produced 5,000 barrels per day. There were only 1,194 wells in the entire Middle East at the end of 1960 as compared to almost 600,000 wells in the United States. These figures for 1960 were computed from data in "World Trends," World Oil, CLIII (August 15, 1961), pp. 72-73, 76. Some of the difference between the producing areas can be explained by differences in physical production conditions.

Conflicts of interest

The theoretical analysis above has been borne out historically and has created conflicts among the various property holders. The conflicts have been of two primary types. They were first, conflicts between different property interests and second, conflicts between the owner of the royalty interest and the owner of production rights. Regulation which came about as a result of conflicts between owners of production interests was of a different type than regulation which was designed to increase production efficiency. Welfare maximizing regulation rested on the mutual benefits of all parties concerned. Regulation adjusting conflicts, however, altered the distribution of income from what it would have been in the absence of such regulation. The adjustment of conflicting claims on a reasonable basis sometimes coincided with production efficiency, but frequently was opposed to it. No matter how commingled in regulatory practice, the problem of economic welfare was distinct conceptually from the problem of adjusting conflicting interests in the petroleum production industry. Technological factors in the industry created conditions wherein regulation was needed if maximum production efficiency was to be obtained.

Technological Factors Leading to Production Regulation

The high proportion of fixed costs to total costs and the uncertainty of results from exploration reduce the short run reliance of output on price in the petroleum production industry. Price instability and a price level intermittently below long run cost of production follow from that separation. In the absence of the dampening influence of production regulation, the discovery and development of potential petroleum production has exhibited great instability. Table E in the Appendix to this work depicts the fluctuations in physical discovery and in price over time. The discovery of the great fields such as East Texas has brought discontinuous jumps in the amount of petroleum offered for sale and has resulted in large price fluctuations where quantities of petroleum produced were not limited by government action.

Prices below long run total costs of production have resulted from the nature of exploration incentives and from the production functions for petroleum under laissez faire. Under laissez faire the possibility of a "bonanza" field caused the individual operator to continue exploration expenditures in the face of industry wide probabilities of less than normal return. For the industry as a whole, then, there were more resources used for exploration than would have been used had the individual operator calculated his exploration expenditures on the basis of industry data, or had exploration been centralized. The El Dorado fixation and easy entry into production prevented the industry from adjusting exploration to the rate of probable discoveries which could have been sustained by the demand for petroleum.

The typical petroleum production function causes production of petroleum even at prices below the total cost of production. The major costs in the production of petroleum are fixed because once a petroleum pool is discovered and the wells drilled, major costs of producing the petroleum have already been sunk. The only variable costs of production are pumping (when necessary), transportation, and the relatively minor expenses of well upkeep, reworking, and maintenance. After the investment has been made, it will pay the producer to continue producing a well so long as the receipts from petroleum sales cover these variable costs. The private entrepreneur would take the future value of the petroleum in place into account only to the extent that he could capitalize it. Because of co-tenancy in the pool and the right of capture, however, the alternative of waiting is seldom attractive. The decision to produce or to abandon is therefore made in the light of present prices, not prospective future prices, given the technological and economic factors present in the petroleum industry. As the limiting case, private decision making could lead to valuing the petroleum at less than the present value of its probable future worth and at less than its total cost of production.

The technology and economics of petroleum exploration and production under laissez faire, following the analysis presented above, caused price to be below cost for many producers (excepting those in the

"bonanza" fields) for long periods of time. This price-cost relationship could be interpreted as a subsidy for consumers at the expense of the producing industry. This redistribution of income from the producers to the consumers was resisted by the producers and their representatives. The means chosen for redressing the situation was legally enforced production control which would stabilize the industry and maintain a cost covering price. The major argument the industry used for production control was phrased in terms of prevention of waste of physical petroleum.

Conservation

The amount of petroleum in the crust of the earth is unknown but it is limited in an absolute sense. Natural petroleum, as a substance, cannot be produced by man. To the extent that a substance has these qualities it can be said to be depletable or to have "stock" or "fund" characteristics. A depletable resource must be allocated over time as well as among competing uses. In the discussion immediately below the outlines of the problem of optimum use rates over time are drawn. Further discussion is delayed to Chapters VI, VII, and VIII where optimum use rates are considered as a goal of the regulation of the field sales of natural gas in interstate commerce. The following discussion abstracts from the issues of equity, income distribution, and economic welfare arising from multiple ownership of pools and from the technical and economic organization of the industry.

The determination of an optimum use rate for petroleum is not a matter of allocating a known quantity of a substance over time in such a way as to maximize the present value of the stream of future benefits. If it were, private decision making under laissez faire in a perfect market could make the allocation decisions satisfactorily. Optimum use rate determination requires consideration of economic and noneconomic factors, including some external to the industry. Obviously the factors chosen and the weight given them is a matter of judgment, influenced by the viewpoint and special interests of the evaluator.

The petroleum supply to be allocated is not known, but it is affected by investment in petroleum discovery and production and by the

amount of cost which will be borne by the price of crude petroleum. Investment in exploration would bring discoveries which would supplement the known supply of reserves in the ground. A higher price for petroleum would increase the proportion of the discovered petroleum recovered. The actual nature of these functions, however, is unknown, especially for the future. Substitutes for natural petroleum would reduce the future demand for petroleum, as would other shifts in demand. Suitability, availability, and cost of any such substitutes, however, are unknown. In the face of this vast uncertainty, the decisions made by the private market, even in the absence of the special problems from which this discussion abstracts, would be far from conclusive in terms of welfare maximizing use rates over time.

Decisions on factors not amenable to private market consideration influence the socially optimum use rate over time of gas. The nation or state as an entity has a much longer time horizon than does the individual. Therefore the optimum social allocation would probably differ from the private market decision even if both the nation and the individual determined optimum use rates on the basis of maximizing the present value of future consumption. The national interest would probably lie in the direction of a longer use rate over time or, put another way, lower present production, because it would value the gas in the future at a lower discount due to its longer potential life span. National defense factors would also affect petroleum use decisions. Similarly, petroleum is a major item in international trade and an important element in international political relations. The rate at which petroleum is used and the amount produced at any one time has an influence on the posture of the nation and therefore judgments as to the broader effects of various use rates are relevant to policy formation. Finally, economic effects external to the petroleum industry would influence public policy but would not directly influence the participants in the industry.

Industry Characteristics Leading to Regulation

Characteristics of the petroleum production industry described above have distinguished it from industries where the general rule of

social harmony is accepted by the public. Government regulation of the petroleum industry has been the product of public dissatisfaction with the operation of the industry under laissez faire. Private decisions interfering with accepted public interests have been altered. As Summers pointed out in his The Law of Oil and Gas:

> Organized society, acting through its agents, the courts and legislatures, and moved to act by this same policy of social welfare, has found it necessary to place some restraint upon the acts done upon land, and to that extent the privileges of landowners have been limited. . . . An attempt has been made to balance conveniences between the landowner, on one hand, and his neighbors as individuals and the community at large, on the other hand. . . . This practice has led to the establishment of the second principle . . . relative to the use of land, that every person should so use his land as not to unreasonably interfere with his neighbors in the use and enjoyment of their lands or to the injury of the community as a whole.[10]

Two closely related problems with different emphases have been the focus of most regulation of the production of petroleum and natural gas. These problems can be summarized under the headings of protection of correlative rights and promotion of conservation. The remaining sections of this chapter take up these categories of regulation in turn.

Regulation to Protect Correlative Rights

Regulation to protect correlative rights was adopted to maintain equity in the relations among owners in a petroleum pool. Such regulation was required because of the property relations under which production was carried on. The enforcement of formal rules regulating the mutual responsibilities and expectations of producers made it possible for firms to adopt profit maximizing adjustments to known conditions. Moreover, the reduction of uncertainty brought stability to the production industry. The protection of correlative rights was thus mingled with other aims and had other results as well. Correlative rights are considered in this section under both the common law and the statutory law.

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[10]Summers, I, par. 61, pp. 147-48.

Correlative Rights under Common Law

Joint occupancy of a pool of petroleum, under the rule established in the United States by Ohio Oil Co. v. Indiana, gave the producer the dual responsibilities of exercising due caution to protect the reservoir and of taking only a due portion of the petroleum.[11] This duty was recognized at law, and in judicial approval of legislation codifying this duty.[12]

The common owners of a petroleum pool were responsible for any damage to the reservoir from negligence, and in some states, even in the absence of negligence.[13] Under common law some restrictions to the rule of capture which vested ownership with the producer were recognized. The most important of these was the duty not to waste the resource. While in one case deliberate waste was allowed as a method to force market sharing, in most jurisdictions waste constituted an actionable offense even in the absence of legislation.[14] Those who shared a common pool have been allowed to recover from the one who allowed the waste to take place in cases of wilful waste,[15] gross negligence,[16] or, in some jurisdictions, common negligence.[17] In the crucial Bandini case it was held

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[11] 177 U.S. 190.

[12] Summers, I, par. 63, p. 190. "The landowner's correlative right-duty relations respecting oil and gas have not been created by conservation statutes but are the result of judicial decisions on the basis of peculiar physical and economic facts of these substances." For a listing of the applicable statutes and further cases not cited below, see Summers, I, par. 63, especially pp. 188-91.

[13] Comanche Duke Oil Co. v. Texas and Pacific Coal and Oil Co., 298 S.W. 554 (Tex. Comm. App. 1927).

[14] Hague v. Wheeler, 157 Pa. 324; 27 Atl. 714 (1893).

[15] Louisville Gas Co. v. Kentucky Heating Co., 77 S.W. 368 (Ky. Ct. App. 1903).

[16] McCoy v. Arkansas Natural Gas Co., 165 So. 632 (La. Sup. Ct. 1936).

[17] Elliff v. Texon Drilling Co., 210 S.W. 2d 558 (Tex. Civ. App. 1948); 216 S.W. 2d 824 (Tex. Civ. App. 1948).

that legislation seeking to impose reasonable restraints upon owners of reservoirs to prevent waste and protect correlative rights was consistent with the United States Constitution.[18]

The common law doctrines arising from the rule of capture were not satisfactory in adjusting the interests of producers in a common supply of oil and gas. The principle of reciprocity was not sufficiently specific to implement the "fair play" spirit of the common law. In addition, there were issues which could not be settled by mere reference to "fair play." Commenting on this matter, Justice Rutledge, dissenting in Republic Natural Gas Co. v. Oklahoma, wrote:

> These difficulties, intensified by the competitive struggle for the product and the inadequacy of common-law ideas to control it, have forced both the states and the federal government to adopt extensive regulatory measures in recent years. This has been necessary both to conserve the public interest in this rapidly depleting natural resource and to secure fair adjustment of private rights in the industry. Rather than being a sacred, untouchable enclave of the common law, the field by its very nature lends itself especially to governmental intervention for such purposes. In this respect it is hardly comparable to situations comprehending only conventional manufacturers and merchants of consumable goods.[19]

Statutory Protection of Correlative Rights

Legislation was enacted in various jurisdictions describing and defining correlative rights. Typical measures of this type were quoted by Summers in his discussion of the subject. The first statement below is found in one of the basic proration orders of the State Corporation Commission of Kansas and the second in the New Mexico statute on this issue.

> Correlative rights shall mean that each owner or producer in a common source of supply is privileged to produce therefrom only in such manner or amount as not to injure the reservoir to the

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[18] Bandini Petroleum Co. v. Superior Court, 284 U.S. 8 (1931).

[19] Republic Natural Gas Co. v. Oklahoma, 334 U.S. 62, 92 (1948).

> detriment of others or to take an undue proportion of the oil or gas obtainable therefrom, or to cause undue drainage between developed leases.
>
> Correlative rights means the opportunity afforded, so far as is practicable to do so, to the owner of each property in a pool to produce without waste his just and equitable share of the oil or gas, or both, in the pool, being an amount, so far as can be practically determined, and so far as can be practically obtained without waste, substantially in the proportion that the quantity of recoverable oil or gas, or both, under such property bears to the total recoverable oil or gas, or both, in the pool, and for such purposes to use his just and equitable share of the reservoir energy.[20]

One of the most important types of statutory protection of correlative rights was enforced market sharing. Ratable taking (market sharing) statutes required that the available market be shared by all producers in a field, which prevented drainage by the producer with sole access to a market. Such provisions were of most importance to the producers of natural gas, who were necessarily restricted to pipeline transportation. Ratable taking statutes were of special significance in situations where one of the producers controlled the market outlet. In the absence of coercion to the contrary, these firms could be expected to utilize their own production exclusively and in this way to produce the reserves belonging to others. During the period of the development of the Panhandle field, for example, the market for natural gas was unable to absorb the total potential production of the field, even had the pipelines essential for its transportation been available. The pipelines which owned reserves carried their own gas, for which they had a market, and at the same time succeeded in draining gas which formerly lay under the property of others into the area under their own leases. That gas which the pipelines purchased was obtained at a very low price because the unconnected producers lacked superior alternatives.

One of the early laws providing for the ratable taking of petroleum products was passed in Oklahoma in 1913.[21] The Texas statute, the

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[20] Summers, I, par. 63, p. 181.

[21] 52 Oklahoma Statutes Annotated, ##232, 233, pp. 104-105. (Laws 1913, c. 198, p. 440, ##2, 3). The provisions of the law were as

Common Purchaser Act, was passed in 1930 with regard to oil and amended to include gas in 1931.[22] Summers described these acts as follows:

> Common purchasers are required to buy from all producers of gas within reasonable reach of its pipelines without discrimination. If more gas is offered for sale than is required by the purchaser, it must take ratably from all producers, without discrimination as to price for gas of the same grade, and in the proportion that the production of each producer bears to the production of the field or common source of supply.[23]

There appeared to be no question as to the constitutionality of these acts with regard to common purchasers or common carriers, because the ends of conservation and equity so obviously demanded such regulation. No final adjudication of the issue has occurred, however.[24] In Texoma Natural Gas Co. v. Railroad Commission of Texas, a federal court enjoined the enforcement of the portions of the act applying to private carriers or purchasers and no appeal was taken.[25] Other cases, including Republic Natural Gas Co. v. Oklahoma, dealt with above, have indicated that such a law would probably be upheld if properly drawn.[26]

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follows: Each owner in the common pool would take his proportionate share of the gas produced based on the open flow of his well gauged each month, but no producer could take more than twenty-five (25) per cent of the open flow. Any purchaser must take ratably at terms agreed upon between him and the seller, with the Oklahoma Corporation Commission to serve as arbitrator in the absence of agreement between the parties. Any firm transporting gas from the field is a common purchaser and must take all gas offered him for sale, even when his own production is part of the total. The purpose of the statute, according to the law, was to prevent any producer from securing an unfair portion of the gas and thereby to facilitate the prevention of waste and the promotion of equity.

[22] Texas Civil Statutes (Vernon, 1948), Art. 6049a, pars. 8-8aa. Similar acts in other states can be found: Darts Louisiana General Statutes Cumulative Annual Supplement, 1937, par. 4785; Compiled Laws of Michigan, 1929, c. 223, par. 11635.

[23] Summers, IV, par. 752, p. 179.

[24] Summers, IV, par. 754, p. 182.

[25] Texoma Natural Gas Co. v. Railroad Commission of Texas, 59 F. 2d 750 (W.D. Tex., 1932).

[26] Robert E. Hardwicke, "Texas, 1938-1948," Conservation of Oil and Natural Gas, A Legal History, 1948, ed. Blakely M. Murphy (Chicago: American Bar Association, Section of Mineral Law, 1949), p. 454.

The regulatory authorities found, however, that the purposes of ratable taking legislation were served through the back door by limiting production to the point where purchasers had to buy from all sellers tendering petroleum in order to meet their needs. The limitation of production was administered, in theory, to give the various producers an equitable share in production. Hence the legal duty to take ratably was secure without specific regulation to this end.[27] The limitation of production can best be discussed along with the conservation rationale which fathered it.

Regulation to Conserve Fuel Resources

Conservation of petroleum, as it was accepted by the courts, the public, and the industry, rested on two different rationales. The first of these was to bring the interests of the individual producers into harmony with the joint interests of the pool owners so as to approximate the results to be expected from one-owner operation in a freely functioning market. This goal might have been accomplished through unitization.[28] The motive here was an increase in economic welfare, as defined above in terms of production efficiency. The second motive for regulation was to alter the allocation of petroleum over time. The total impact of conservation regulation was to stretch out the time period over which petroleum was produced. Conservation regulation as a political fact has also influenced the distribution of income among producers and between producers and other sectors of the economy. While the three aspects of conservation regulation, economic welfare, use rates over time, and the distribution of income, can and should be isolated in an analytical sense,

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[27] Summers, IV, pars. 752, 753, pp. 179, 181.

[28] Unitization is the operation of the entire pool as though it were one unit, with each producer's income being determined as one fraction of the entire income from the reservoir, calculated on the basis of the produced value of the hydrocarbons originally underlying the particular tracts. The advantage of unitization is that the producers can in fact order their decisions on the basis of the total welfare of the reservoir without having to be concerned with equity or correlative rights as between the separate owners. Many states have established statutes to allow, or in some instances, force unitization.

they have operated jointly, if unintentionally, in the real world of conservation regulation. They are considered below as joint products, if not goals, of regulation falling in the conservation category.

The early statutes regarding conservation required such duties as plugging abandoned wells, casing wells, etc.[29] These statutes for the most part were noncontroversial and did not require adjudication for their approval and enforcement. Such codes were rather consistent among the various states, and, on Federal land, were enforced by the Department of the Interior.[30] The regulation of the rate of production, on the other hand, was very important and highly controversial.

Production Rate Control

The rate of production from any particular petroleum horizon sometimes affects ultimate recovery of reserves in place. The technical explanation presented in a recent book on the subject was cast in these terms:

> . . . many reservoirs are clearly rate sensitive and there is a maximum efficient rate (MER) above which there will be a significant reduction in the practical ultimate oil recovery. . . . some mechanisms at work in the reservoir, which, in a practical period of time, can substantially improve the recovery of the oil in place. These mechanisms include (a) partial water drive, (b) gravitational segregation, and (c) those effective in reservoirs of heterogeneous permeability.
>
> Where initially undersaturated reservoirs are produced under partial water drive at voidage rates (gas, oil, and water) considerably in excess of the natural influx rate, they are produced essentially as solution gas-drive reservoirs, modified by a small water influx. . . . the loss is due to the increase in the viscosity of the oil and to the decrease in the volume factor of the oil at lower pressures, and also to the earlier abandonment of the wells which must be produced by artificial lift. Because of the higher oil viscosity at the lower pressure, producing water-oil

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[29]Because of its rather peripheral interest to the central subject of this study, a detailed presentation of statutory and judicial law on conservation is not presented here. Such can be found in Summers, I, IA, pars. 71-106; V, 5A, pars. 921-946. (Texts of Statutes).

[30]Summers, I, pars. 71-73, pp. 194-211.

ratios will be higher, and the economic limit of production rate will be reached at lower oil recoveries.

The MER for water-drive reservoirs is that rate above which there will be insufficient time for effective (gravitational) segregation, and therefore a substantial loss of recoverable oil.

As water invades a reservoir of heterogeneous permeability, the displacement is more rapid in the more permeable portions, and considerable quantities of oil may be bypassed if the displacement rate is too high. At lower rates there is time for water to enter the less permeable portions of the rock and recover a larger portion of the oil.[31]

This technical explanation of the factors influencing ultimate recovery from petroleum reservoirs treated the economic content of MER only implicitly. Craft and Hawkins wrote of the "significant reduction in the practical ultimate oil recovery." (Emphasis supplied.) The significance of the differences in ultimate recovery lies, if anywhere, in the cost and value relationships involved. The MER is the rate where faster production would lead to a loss in revenue from lowered ultimate production sufficient to offset the reduction in costs from shorter production periods. The economic content of the concept is apparent. Both the expected price of marginal petroleum from the pool in question and the costs of stretching out production must be incorporated either implicitly or explicitly into calculations determining optimum MER if it is to have any economic meaning. One of the most important variables affecting these costs is the interest rate or cost of capital. Implications of the MER for regulation policy will be discussed further in the last section of this chapter.

Production at MER would maximize private net return to an undivided reservoir ownership. This would not be the obvious best policy for the individual producer in a divided, unregulated reservoir. In the later case, the interests of an individual producer are weighted toward rapid production in order to drain or avoid drainage. The reason is that restriction by one producer only allows others to produce a greater portion of the reserves without guaranteeing the restricting

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[31] B. C. Craft and M. F. Hawkins, Applied Petroleum Reservoir Engineering (Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1959), pp. 197-199. (Emphasis in the original.)

producer the opportunity to benefit from the increased total recovery. In addition restricting production to the MER in only one portion of a water driven pool sometimes has led to less ultimate recovery than rapid production everywhere since uneven water influx isolates and seals off certain parts of the reservoir from the wells. In the absence of unit operation, coercion is therefore required to force all producers to act individually to their own collective and several best interest. Such coercion, through government regulation, is incapable of making precise estimates of MER and of formulating regulatory policy which will perfectly accomplish its ends. The complex nature of the relationships and their dynamic nature preclude such results. Justification for regulation rests on the presumption that it would more closely approximate the optimum production level than would operation under laissez faire.

The restriction of production to MER in order to prevent underground waste through the inefficient use of reservoir energy was enforced by the federal government on national lands and by the states for regions under their jurisdiction.[32] California, Kansas, Louisiana, New Mexico, Oklahoma, and Texas were among the states which passed legislation designed to conserve reservoir energy to increase the ultimate recovery ratio.[33] Typical of such legislation was that of Oklahoma which defined underground waste as including:

> . . . water encroachment in the oil or gas bearing strata; the use of reservoir energy for oil producing purposes by means or methods that unreasonably interfere with obtaining from the common source of supply the largest ultimate recovery of oil.
>
> . . . the inefficient or wasteful utilization of gas in the operation of oil wells drilled to and producing from a common source of supply; the production of gas in such quantities or in such a manner as unreasonably to reduce reservoir pressure or unreasonably to diminish the quantity of oil or gas that might be recovered from a common source of supply; the escape directly or indirectly, of gas from oil wells producing from a common source of supply into the open air in excess of the amount necessary in the efficient drilling, completion, or operation thereof;

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[32]Summers, I, pars. 71-73, pp. 194-211.

[33]Summers, I, par. 76, pp. 220-25.

> . . . and the unnecessary depletion or inefficient utilization of gas energy contained in a common source of supply.[34]

The Oklahoma statute was upheld in Denver Producing and Refining Company v. State.[35] The California statute was the first of its kind to reach a final court test. In Bandini Petroleum Company v. Superior Court the Supreme Court upheld the validity of the conservation statute as an exercise of the legitimate power to prevent waste. The wording used, the Court held, was neither too vague nor too inconclusive.[36]

Gas Waste Prevention

The conditions under which natural gas is produced create conservation problems unique to this product. Natural gas has two basic functions, the first being to facilitate the production of oil by lowering viscosity and providing reservoir energy by expansion and the second being to provide a source of energy and a source of hydrocarbons for chemical processes. Failure to utilize gas efficiently to satisfy these functions was termed waste in the course of conservation development.

Conditions which give rise to gas waste under laissez faire

Some hydrocarbon traps consist of a gas cap over the oil pool. If such is the case, the expansion of the gas forces the oil to the surface assuring reasonably complete and efficient production through wells producing from the oil strata. If the gas cap is removed before the oil is produced, then reservoir energy is reduced, viscosity of oil is increased (because the oil is no longer saturated with gas), and ultimate recovery of petroleum is lessened. Reservoir operation to maximize total physical recovery of hydrocarbons uses the gas drive to produce the oil and delays production of the gas until the oil is

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[34] 52 Oklahoma Statutes Annotated, pars. 86.2, 86.3.

[35] Denver Producing and Refining Co. v. State, 184 P. 2d 961 (Okla. Sup. Ct. 1947).

[36] 284 U.S. 8.

substantially recovered.[37] Given recent economic relations, essentially the same pattern maximizes both financial return and physical recovery.[38] Fragmented pool ownership, in the absence of regulation, would not lead to maximizing operation. The owners of the gas portion of the pool would not wish to delay recovery nor would they wish to allow the gas to migrate elsewhere, even to produce the more valuable oil. Hence waste of reservoir energy results when individual owners act to maximize their own return under laissez faire.

Unitization of the producing structure is one means of resolving intrapool conflict of interest to conserve reservoir energy and increase recovery ratio. In the absence of compulsory unitization, there is difficulty in gaining the necessary approval of all reservoir interests. State regulations controlling production from various portions of a single reservoir have been approved as an alternative to either laissez faire or unitization. These have had the aim, at least, of forcing optimal production patterns on the producers.

Prevention of the excessive venting of gas is another area where regulations were required in order to encourage producers to act in their joint best interests. Reservoirs where oil is saturated with gas produce both oil and gas as a joint product. Expansion of the gas as it goes out of solution forces the oil to the surface.[39] In the absence of a market for the gas, individual producers under laissez faire market their oil and vent or flare the casinghead gas produced.[40] It is not economical for the producer to return the gas to the formation because while the producer would bear all of the cost, the benefits would be

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[37] Craft and Hawkins, pp. 147-51.

[38] The present production of gas would be warranted, considering only the profits of the undivided reservoir interests, if the costs of waiting (including expected price change) were greater than the value of the petroleum sacrificed.

[39] Craft and Hawkins, pp. 97-114, passim.

[40] "Casinghead gas" is that gas which is produced with oil as a joint product. The name comes from the separation of the liquid and gaseous hydrocarbons at the top of the well casing, hence "casinghead."

shared by all producers in the pool. The regulatory commissions in some states were authorized to prevent the dissipation of the gas by requiring that it be used for some "worthwhile" purpose. If no such purpose were available, the producers were required either to return the gas to the producing formation or to cease production. The rules adopted recognized the economic limits to gas salvage and therefore allowed venting and flaring within certain permissible gas-oil ratios.[41] By increasing future gas sales and maintaining reservoir pressure, such regulations forced all producers to do that which was profitable for them jointly, but not for any one of them acting alone.

Some conditions in the field market led to direct control. These conditions generally exhibited a pattern compounded of joint occupancy in the reservoir and limited market outlets. Potential gas production at times exceeded the fuel market. If one producer obtained a market for his gas, other producers in the same reservoir were willing to accept any price which would more than cover variable costs because otherwise their gas would be drained without compensation. Hence the producers were forced to sell their gas though they would have preferred holding it at that price had the option been available. In fields where removal of gas liquids was feasible, dry gas prices were depressed even further because the stripping operations partially compensated the producers for the necessary direct production expenses. The distress level gas prices resulting made it economical for carbon black manufacturing concerns, and other gas users, to use a production function which minimized capital and labor costs but was relatively prodigal in its use of gas. Given these conditions, end use control was adopted for two reasons. First, the contention was that the present value of the gas was not represented by its price. Second, the long run social utility of the gas was judged to be higher than the present value of the gas for socially inefficient use or dissipation. Under the typical regulation, the nature of which is discussed below, the producers were left with the options of finding

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[41] The gas-oil ratio is the ratio between the amount of gas produced, measured in thousand cubic feet (Mcf) units at standard pressure, relative to the amount of oil.

a suitable, efficient use for the gas, non-production, or returning it to the producing formation after it had been stripped of liquids. For the most part such regulation was satisfactory to the producers because it joined the individual interests of producers into the jointly maximizing interests of the group.

Regulation to prevent gas waste

Gas waste, as defined above to include venting, flaring, operation at high gas-oil ratios, unnecessary dissipation of reservoir energy, and inefficient or wasteful end use, was prohibited in various states by legislative enactment. So called "surface" waste of gas through burning, escape, leakage, improper storage, and uncontrolled wells was prohibited by statute in most of the producing states. A search of the record yielded no significant challenge to the validity of a properly drawn statute of this type. The Corzelius v. Railroad Commission case dealt with the authority of the Texas Railroad Commission to authorize a third party to control a cratering well which was wasting great quantities of petroleum and creating a public hazard. This case was decided in favor of the Railroad Commission on grounds of its authority to protect correlative rights and to prevent surface waste.[42]

The flaring or venting of gas produced in conjunction with oil or in natural gasoline stripping operations was long considered a waste in petroleum production. The basic conservation statutes in many of the states prohibited this practice directly or have been held to do so through general language. Here too, however, the matter of "waste" did not depend on physical results alone, nor even on formal gas-oil ratio regulations. In an illustrative case, Texas Railroad Commission v. Shell Oil Corporation, the court held: "Whatever dictates of reason, fairness, and good judgement under all facts would lead one to conclude is a wasteful product in production, storage, or transportation of oil and gas, must be deemed to have been denounced by the legislature as unlawful

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[42] Corzelius v. Railroad Commission, 182 S.W. 2d 412 (Tex. Civ. App. 1944).

in statutes prohibiting waste."[43] Following this "rule of reason," the Texas Railroad Commission enjoined the Shell company against venting or flaring casinghead gas in the Seligson field, even though the gas was produced in compliance with the general gas-oil ratio, because containment was feasible.

End use regulation in the interest of conservation began before the turn of the century with rules prohibiting the continuous use of gas for illumination and requiring efficient combustion devices.[44] But by far the most important end use regulations by the states restricted the manufacture of carbon black. Carbon black production uses a great deal of gas for the quantity of output. For this reason carbon black plants are feasible only where fuel prices are quite low. The quantity of gas consumed per pound of carbon black produced depends on the type of manufacturing process used, the output per Mcf of gas varying over several magnitudes among the processes. Further, carbon black manufacture can utilize "sour" gas (gas with small amounts of hydrogen sulfide) without treatment, while a relatively expensive treatment process is required before sour gas is acceptable for most other uses. On the basis of these factors, the use of sweet natural gas for carbon black manufacture, especially with inefficient processes, was attacked as "economic waste." The states reacted to these arguments by passing regulatory measures.[45]

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[43] Texas Railroad Commission v. Shell Oil Corporation, 206 S.W. 2d 235 (Tex. Sup. Ct. 1947).

[44] Summers, I, par. 78, pp. 252-53, citing: Burns' Annotated Indiana Statutes, 1933, ##10-2407, 10-2408, and 10-2409. The constitutionality was upheld in Townsend v. State, 47 N.E. 19 (Sup. Ct. Ind. 1897).

[45] Some states have prohibited the manufacture of carbon black from natural gas (Florida, Georgia, New Mexico, Wyoming); others have limited the gas so used to sour gas (Alabama); still others allow it only when there is no other market for the gas (Indiana, Mississippi); and one state (Arkansas) allows the use of only casinghead gas for carbon black manufacture. Some states allow the use of natural gas if approval is specifically given (Alaska, Louisiana, Michigan, Oklahoma, Washington) and the rest of the producing states (Kansas, Nevada, North Carolina, and Texas) set up various specified conditions under which carbon black can be produced. Summers, I, par. 79, pp. 254-55.

The authority of the states to regulate the use of natural gas was challenged in the courts. In Henderson v. Thompson, the Supreme Court held that such regulation was not arbitrary or unreasonable. It also held that such control did not violate the clause guaranteeing the sanctity of contracts. End use control of this nature was not repugnant to the Constitutions of either Texas or the United States, and concerned a matter within the states' jurisdiction as affecting the public interest, according to the Supreme Court.[46]

Restriction of Production to Reasonable Market Demand

Restriction of production to "reasonable market demand," defined below, was advocated on various grounds. In addition to the obvious effect on petroleum use rates, it stabilized the petroleum industry and altered the distribution of income, both within the industry and between economic sectors. Reasonable market demand regulation was different in intent from the regulation of production rates along the lines of MER and restrictions on the wastage of natural gas. These measures, discussed above, were primarily designed to correct conditions within the reservoir which led to an inefficient allocation of resources and an inequitable distribution of pool income. In contrast to these intraindustry adjustments, reasonable market demand regulation changed some of the basic decision variables and substituted government determination for market decision making in certain important dimensions.[47]

"Reasonable market demand" has been defined by the courts as "the amount of oil reasonably needed for current consumption, together with a reasonable amount for storage and working stocks."[48] From the Interstate

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[46] Henderson v. Thompson, 300 U.S. 258 (1937).

[47] In the discussion that follows the writer treats reasonable market demand regulation in general except where specific reference to a particular state is made. Emphasis is placed on the effect of reasonable market demand on price of petroleum because of the importance of this impact in setting the framework in which other decisions are made.

[48] Railroad Commission v. Continental Oil Co., 157 S.W. 2d 695, 699 (Tex. Civ. App. 9th. 1941).

Oil Compact Commission Forms for Oil and Gas Conservation Laws comes the following definition:

> The words "reasonable market demand," as used herein, shall mean the demand for oil or gas for reasonable current requirements for current consumption and use within and outside the State, together with such amounts as are reasonably necessary for building up or maintaining reasonable storage reserves of oil or gas or the products thereof, or both such oil or gas and products.[49]

The influence on price of reasonable market demand regulation is discussed below to deal with the issue of whether this regulation merely reacts to changes in market conditions or whether it has a positive policy making role. The conservation rationale for market demand adjustments is then explored. This section ends with a survey of the enactment and enforcement of reasonable market demand statutes.

Reasonable market demand as price fixing

The reduction of supply, ceteris paribus, increases price. Regulation which reduced the available supply of petroleum and had no other effect would be presumed to raise the prices to crude producers. MER regulation, along with that seeking to reduce gas wastage, etc., was directly related to some physical measure though it also had price implications. Restriction of production to reasonable market demand, however, was intended to affect the economic-marketing relationships in the petroleum industry. "Price fixing," as the term is used here, covers the twin attributes of stabilizing prices to prevent large fluctuations and establishing the general price level at which that stabilization occurs. No implication is intended that price fixing through reasonable market demand regulation extends to formal determination of specific prices in specific markets.

Regulatory commissions and spokesmen for the petroleum industry have often denied or minimized the economic implications of reasonable market demand regulation. As evidence for this contention, the absence of any specific direct reference to price in the method used to determine

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[49] Hardwicke, "Texas, 1938-48," p. 468.

reasonable market demand is submitted.[50] The regulatory agencies have stressed that they ignore price and determine reasonable market demand from such factors as purchaser nominations, estimates prepared by the United States Bureau of Mines, expected imports of foreign crude, and other diverse elements such as weather, seasonal factors, stocks on hand, etc. With these data available, petroleum production levels can be set to minimize waste.[51]

The physical, noneconomic approach to regulation was illustrated by Ernest O. Thompson, as Chairman of the Texas Railroad Commission, in a speech delivered to the Interstate Oil Compact Commission: "After all, only so much oil can be sold in the market place so what good is accomplished by crowding the market?"[52] The message intended in his speech was that physical consumption levels were predetermined and that it was the role of the regulatory agencies to see that this quantity of petroleum and no more was produced. Therefore the agencies were engaged solely in prevention of physical waste. Thompson's statement, when interpreted in economic terms, was that the demand for petroleum was so highly inelastic that only so much would be purchased no matter what the price. The implication of this statement is that price is purely supply determined and that the regulatory agencies, by setting supply, fix price, certainly not the interpretation Thompson intended.

The regulatory authorities, for the most part, have not taken the price influence of their decisions into consideration as an explicit variable. Instead the effect of regulation methods has been to accept the going price as the price for the demand determination period. The Texas Railroad Commission, by far the most important of the regulatory agencies, has adjusted the amount supplied to the amount demanded at the

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[50]Robert E. Hardwicke, "Oil Conservation: Statutes, Administration, and Court Review," 13 Mississippi Law Journal 386 (1941).

[51]The conservation rationale for reasonable market demand regulation is discussed in the next section.

[52]Ernest O. Thompson, "The Oil and Gas Market Demand Law," The Interstate Oil Compact Commission Committee Bulletin, II (June, 1960), p. 13.

going price. Price is not changed or manipulated directly by the restriction to reasonable market demand. Instead, changes which would have occurred in the absence of regulation are prevented.

A hypothetical diagrammatic presentation of the supply-demand-price situation brought on by reasonable market demand control, Figure 1, illustrates the above points. The regulatory commission when it meets knows the level of production for the month in which it is meeting. It also has some knowledge of changes in stocks which indicates the exactness with which the prevailing price level is equating demand for petroleum with the amount supplied. Indications of changes in demand for the forthcoming month are available. In the diagrams below, let S_p be the potential supply of crude (short run supply curve for the industry), D be the demand curve for crude petroleum during a given month, and RMD the reasonable market demand determined by the regulatory agency.

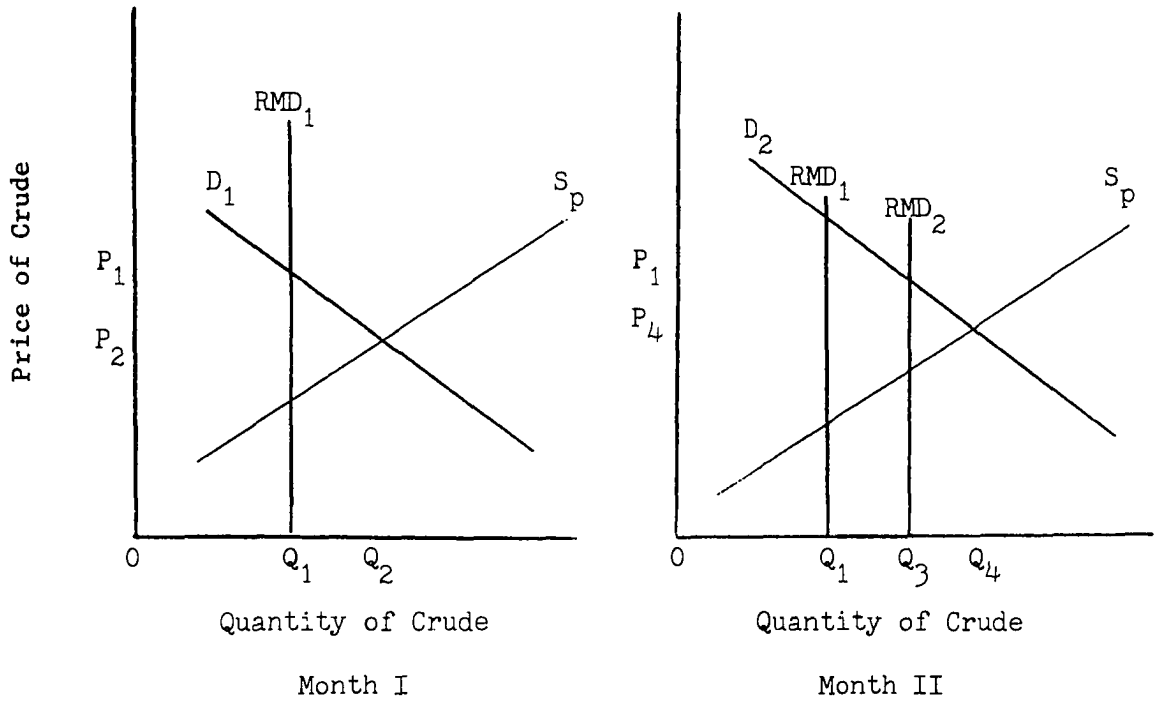

Figure 1. Supply, demand, and price under reasonable market demand regulation.

The diagram at the left, Month I, represents the conditions at the time the Commission meets to determine RMD for the next month. The supply and demand for the industry under laissez faire are indicated by schedules S_p and D_1. The equilibrium levels of price and quantity are P_2 and Q_2 respectively. Actual price is P_1 which is established by the point where industry demand is in equilibrium with the amount of production (Q_1) authorized by the Commission in its previous month's meeting. Taking month I as the base, assume that the agency expects an increase in demand during month II. The diagram at the right illustrates the factors faced by the Commission as it makes its RMD decision. Under laissez faire, a shift in D_1 to D_2 would cause Q_2 to increase to Q_4, and P_2 would rise to P_4. Under reasonable market demand regulation, however, the amount of petroleum supplied, RMD_2, is so adjusted that all produced, Q_3, would be marketed at the prevailing price of P_1. The Commission need not consider price deliberately in its proceedings so long as the estimates of expected purchases are predicated on price being unchanged.

The fact that price is not considered explicitly, however, has led regulatory commissions to refuse to recognize its importance. If the contention that price was not regulation-determined could be relegated to the disputations of special interest groups, the matter would be of no concern. The question of optimum use rates, however, makes the ability of reasonable market demand regulation to affect price important as a policy matter. If this control exists and is applied, the regulating agencies must accept the responsibility for this control rather than appealing to market forces as arbiter of production decisions. One test of the issue was suggested by E. J. Davis, Jr., Official Representative of Oklahoma to the Interstate Oil Compact Commission. He reviewed the history of market demand regulation in Oklahoma in a speech in 1960. After discussing the early problems of oil and gas regulation in Oklahoma he had the following comments on the subject of immediate concern:

> Since 1915, it has been the duty of the Oklahoma Corporation Commission to limit the production of oil to market demand and transportation facilities in order to prevent waste . . . in the early history, there was the contention, which is the contention of some today, that this law was intended for the purpose of fixing price, rather than to prevent waste. A reading of the opinions of the Corporation Commission . . . discloses a most able interpretation of the intent of the law, clearly pointing out that this law was passed and its application was for the purpose of preventing waste and not to fix price, although price might be incidentally affected in some cases. But the ups and downs of price during all this period clearly shows that the interpretation originally placed by the Corporation Commission . . . amply supports the real purpose and object of this conservation law.[53]

A survey of variations in the price of petroleum over time, both before and after market demand regulation was instituted, was conducted to test Davis' contention. The Oklahoma Legislature in 1933 passed an effective statute limiting production to reasonable market demand by taking into account the legal problems raised by the Champlin Refining case of 1932.[54] October 1, 1933, was taken as the breaking point between the absence and presence of reasonable market demand regulation in Oklahoma in the examination of price variation. Monthly prices of Mid-Continent 36-degree gravity crude oil are available from 1913 through 1960.[55] The difference, ignoring sign, of prices from month to month

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[53]E. J. Davis, Jr., "Early History of Market Demand in Oklahoma," The Interstate Oil Compact Commission Committee Bulletin, II (June, 1960), p. 22.

[54]Champlin Refining Company v. Corporation Commission of Oklahoma, 286 U.S. 210 (1932). (Hereinafter referred to as Champlin.)

[55]Data for 1913-1958 from American Petroleum Institute, Petroleum Facts and Figures, Centennial Edition, 1959 (New York: American Petroleum Institute, 1959), p. 375. Authorities cited: U. S. Geological Survey, Platt's Oil Price Handbook and Oilmanac. Data for 1959-1960 from American Petroleum Institute, Petroleum Facts and Figures, 1961 Edition (New York: American Petroleum Institute, 1961), p. 226. Authority cited: Platt's Oil Price Handbook and Oilmanac. The Centennial Edition refers to "Oklahoma-Kansas 36-degree to 36.9-degree gravity crude." The 1961 Edition refers to "Oklahoma 36-degree to 36.9-degree gravity crude," but the same prices held in 1951 and 1958, for which references were available from both sources, and therefore the difference in definition apparently did not upset the comparability of the series.

was arranged in a frequency distribution by amount of difference for the period from January, 1913, through September, 1933. This distribution was compared with a similar distribution of prices from October, 1933, through December, 1960.[56]

The number of observations in each series was roughly similar, 248 for the pre-reasonable market demand period as against 275 for the period after. In the first series there were changes from month to month 72 times and no changes 176 times or a change 29.0 per cent of the months. For the period after October, 1933, however, there were changes in prices only 15 times or 5.5 per cent of the months. All but three of these latter changes were changes upward, and two of the downward changes were in 1958-1959 and totaled only $.10.

Another indication of the difference in fluctuations in prices before and after the initiation of regulation was the total amount of change experienced. The pre-reasonable market demand period experienced a total of $19.12 change or an average change per month of $.077. After regulation, even including the period of rapid price increase following World War II, the total change in price was $2.57, or an average change per month of $.009, approximately one ninth of the average monthly change of the earlier period.[57] This test suggested by Davis indicates the effectiveness of regulation to reasonable market demand in stabilizing the price of crude oil, whatever the intent of regulation. The prevention of petroleum waste was, of course, the major rationale for market-oriented regulation.

Conservation rationale for restriction to reasonable market demand

Three major arguments have been advanced for the position that reasonable market demand regulation prevents physical waste. These are that production above reasonable market demand causes petroleum waste on

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[56]The period of stability during World War II, from December, 1942, through February, 1946, was ignored to eliminate the effect of direct price regulation.

[57]Calculated from monthly price data cited in footnote 55. Data and calculations shown in Appendix Table F.

the surface; production beyond reasonable market demand causes "premature abandonment" and wasteful practices; and production above reasonable market demand brings "inferior" uses for petroleum and consequent sub-optimal use rates over time. Assumptions and value judgments relied on for the arguments are examined in each case below.

Prevention of surface waste

The first argument for limitation of production to reasonable market demand is that under laissez faire the industry would produce more petroleum than would be sold, and a portion of the excess amount of petroleum supplied would be wasted on the surface because of the physical characteristics of petroleum. Petroleum is a highly volatile mixture of hydrocarbons, some of the most valuable of which escape into the air at atmospheric pressure. Storage above ground, then, brings physical waste from vaporization. Petroleum is also very inflammable. Any above ground storage is subject to a fire hazard which is partially a function of the amount of petroleum on hand. Petroleum, being a liquid, is also subject to leakage from its containers. Suitable storage space is limited and expensive. The argument follows that it is wasteful of petroleum to use unsuitable storage such as earthen tanks, and wasteful of other resources to build an amount of tank capacity in excess of the quantity needed to assure a smooth flow of petroleum products from the well to the consumer. The above considerations lead to the conclusion that a legitimate conservation objective would be to minimize the amount of oil above ground. "The best place to store oil until you need it is in God's reservoir."[58] These arguments are analyzed in the following paragraph.

Under only two conditions, assuming profit maximization, would petroleum be produced but not utilized. First, if a floor were maintained under prices amount demanded would not adjust to amount supplied.

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[58]Ernest O. Thompson, as quoted by Ira Butler, "The Texas Market Demand Statute and the Experiences in its Application to Practical Conditions," The Interstate Oil Compact Commission Bulletin, II (December, 1960), p. 8.

If prices were flexible, however, presumably there would be a price at which the amounts demanded and supplied would reach equilibrium. Price flexibility would increase with elimination of market demand regulation. Hence no particular surface stock build-up would consistently follow unrestricted production except that greater price variability might lead to an increase in storage for speculative purposes, just as production-consumption adjustments would result in stocks larger than those necessary under the stabilizing influence of market demand regulation. For the second condition, a zero marginal cost of production, including the opportunity cost of future production, would lead to increases in above ground stocks. If petroleum became in effect a free good, (possible during the short run in localities with free flow production and insufficient transportation or marketing facilities) then production would not fall nor amount demanded rise sufficiently to bring equilibrium and some petroleum would be produced without a market. Just such a combination of circumstances occurred in the East Texas field at the time of its discovery and development. Under more normal circumstances, however, and in the presence of price flexibility, the only increase in surface waste under laissez faire would arise from the marginal quantity of waste through leakage, evaporation, fire, or improper storage justified in the light of the lowered value of the product in relation to the cost of waste prevention.

Prevention of reservoir waste

The second rationale for the limitation of production to reasonable market demand is that wasteful reservoir management practices and premature abandonment of producing properties resulted from unrestricted production and lower prices.[59] The lower the price, the argument goes, the lower the cost of production required of any given well if it is to remain profitable to operate. Lower price, it is concluded, forces operators to abandon high cost wells. The producing wells will operate so long as variable costs are covered, but if price falls below variable

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[59]Continuing the pattern established above, the arguments for the position are explained and then evaluated in later paragraphs.

costs then the production will be lost. The deposits underground which feed the marginal wells, once abandoned, will probably never be produced. Reactivation requires a large investment which could not be economically sustained at prices within prospective ranges.

The added future petroleum supplies created by conservation of marginal deposits are expected to contribute to the long run availability of petroleum and therefore to stabilize petroleum prices over time. Without the crude from the marginal wells the supply of low cost petroleum will be exhausted more rapidly. The exhaustion of low cost crude will drive prices up in rationing the limited supply among consumers and in calling forth other supplies or substitutes for fossil fuel. In addition, alternative sources of supply might be more expensive in the future than sub-marginal sources in the present. A subsidy for marginal producers, it is argued, will save social resources in the longer run.

A stabilized and high price is also expected to prevent resource waste by encouraging the producers to follow good conservation practices. The contention is that at low prices the producer cannot afford to take precautions to prevent waste, assure highest possible recovery (perhaps through secondary recovery projects), and minimize avoidable losses. A stable and high price, for these reasons, provides the economic incentive to producers to protect their future supplies of petroleum.

Two elements are present in the reservoir waste argument for reasonable market demand regulation. The first is that it is a waste to abandon sub-marginal deposits and the second is that restriction on production is the best means to minimize that waste. There are two causes for reservoir waste, abandonments because of price fluctuations and abandonments because of the level of price abstracting from fluctuations. The stabilization of prices to prevent abandonment because of passing fluctuations in price can be justified insofar as resources are saved which would unnecessarily be expended for new production upon the revival of price.[60] The second matter, the problem of the level of petroleum

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[60]Estimates of costs of returning a well or reservoir to production once abandoned, however, rest on present experience with relatively stable or upward trending prices. With prospects of rather stable prices,

prices, hinges on whether future production costs will be enough greater than present production costs (in the absence of regulation) to justify present high cost production.

A decision that sub-marginal wells should be retained in production to minimize resource use in production does not lead automatically, however, to reasonable market demand regulation. In the first place, production of marginal deposits could be subsidized without the general subsidy of all production through higher price. Secondly, restriction of production to raise price is no necessary incentive for better reservoir management. The extra price obtained because of restriction applies only to that portion of the underground reserve that is produced. No incentive is provided for conserving oil unless the amount of oil conserved is related to the amount that a given producer may produce at the subsidized price. Without this relationship, the higher price is simply a windfall gain to the producer which does not influence his production decisions.

The regulatory policy of most states has recognized the existence of this problem. Some have sought to grant special incentives to the production of marginal deposits in addition to the general subsidy of a higher price. Most states have relieved marginal wells from any production restriction. Such policies have not, however, been free of uneconomic allocation consequences. Under severe restriction some of the free flow marginal wells are allowed to produce more than the much more efficient supra-marginal wells. This condition violates generally held principles of basic producer equity and produces questionable economic results. The marginal well statutes, in the absence of production

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chances of ever returning to a well once abandoned are very small, and operators therefore cannibalize the wells. Hence, an operator does not consider part of his fixed costs as sunk, for he does have some alternative use for part of the equipment and it has value for him. If, however, the expectations were for price variation, rational operations might include temporary abandonment without cannibalization which would lead to fewer abandonments (since there would be no salvage incentive) and less expensive reentry into production. One cannot, therefore, blindly extrapolate present experience with marginal wells into an industry operating under different expectations and with a different institutional structure.

bonus programs for other beneficial reservoir management practices, also have sometimes interfered with the very increase in ultimate recovery that they were designed to promote. If, for example, a well were flowing at a high marginal rate, the producer would possibly not invest in secondary recovery or reworking expenditures because he would not be commensurately rewarded for his increased production potential.

Prevention of "inferior" use

The final rationale used to defend the reasonable market demand statutes is that in the absence of regulation, petroleum prices would fall and lead to "inferior" uses of petroleum. The terms "inferior" and "superior" were defined as the magnitude of consumer surplus in two different uses. A superior use was one for which the consumer would pay a high premium if faced with an all or none choice, while an inferior use was one where the consumer would pay little or no premium if faced with such a choice but would instead shift to available alternatives. Inferior use would prevent the use of the same petroleum for superior uses at some future time. In the more general statement, this argument held that the market did not reflect the proper relationship between present and future use values, and in this form was discussed above in connection with gas production regulation.

Analysis of the inferior use argument led the writer to the conclusion that there were really two different situations involved in this argument, depending on the time period considered. Given the nature of the petroleum production industry, without production restrictions price in the short run would fall below the average total cost of production measured either in historical or replacement terms. At this low price gains from uses found for petroleum would not be worth the cost of production of the petroleum as measured by average total cost. Use for these ends would be subsidized, both in the private sense of production at below full cost and in the social sense of greater consumption of resources than that justified by the utility received. Yet, in the short run such use was optimal, so long as variable costs were covered and replacement costs were ignored. In the long run situation,

replacement costs could not be ignored. Alternative uses of resources might yield more benefit. The judgment that over the long run petroleum was undervalued and hence was used for inferior purposes rested on a decision that market allocation was inefficient. The individual producer lacked the information to make a production decision on rational economic grounds because of the uncertainty in the industry and in potential substitutes. Moreover, because of the technology and organization of the industry and its capital markets, whatever decisions were made would not be fully reflected in petroleum price and use rates. Hence an irreplaceable substance was used up more or less rapidly on grounds independent of any consistent comparison of time oriented alternative uses.[61]

Enactment and enforcement of reasonable market demand regulation

The limitation of production to reasonable market demand or prevention of economic waste was the central issue in state conservation regulation. This issue was more controversial and more divisive in effect than all the others, partly, perhaps, because it so obviously removed petroleum production from the operation of the free market. The battle for restriction of production was fought on two levels, and in two phases. First came the effort to establish the principle in the agencies and in legislation, and then came court review of the production limitation statutes on equity and constitutional grounds.

The first legislative enactment of "reasonable market demand," and indeed the first official use of that term, came in Oklahoma in

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[61] See Chapter VI below for a discussion of the problem of use rates in connection with regulation of the natural gas industry. This decision requires a framework within which welfare maximization may be attempted. Historically, the "long view" of higher future utility of petroleum has been characteristic of the regulatory commissions and the larger corporations with their greater planning horizon as compared with the smaller independent. Consequently the regulatory agencies have generally followed a policy of restricted production and price above long run cost of production in the absence of restriction. The restriction itself, however, raises production costs by forcing use of otherwise sub-marginal wells and by making production rates less than optimally efficient--efficiency defined by economic MER.

1915.[62] Though the statute was on the books, it was not enforced and no major applications of it were made from 1915 until 1928-29. The intervening years were ones of prosperity for the industry and production beyond available market was no problem.[63] With the discovery of the Seminole and Oklahoma City fields in 1928 and 1929, the provisions of the law were applied and brought to the first court test. The statute itself was upheld in the case of C. C. Julian Oil and Royalties Co. v. Capshaw,[64] but final implementation waited on the Champlin case where the Act's constitutionality was upheld, and on supplementary legislation.[65] Other controversy over the reasonable market demand statute followed, but after the Champlin case it was centered on the application of the statute rather than on its validity.[66]

The Texas conservation statute prohibited the limitation of production to prevent "economic waste" at the time the discovery of the East Texas field brought a great upsurge of production.[67] Despite this statute, however, the Railroad Commission attempted in 1931 to limit production in a manner approximating reasonable market demand. The courts ruled that the Commission did not have this authority.[68] This

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[62] 52 Oklahoma Statutes Annotated, pars. 271-279.

[63] Davis, p. 22.

[64] C. C. Julian Oil and Royalties Co. v. Capshaw, 292 P. 841 (Okla. Sup. Ct. 1930).

[65] 286 U.S. 210, 230.

[66] For a detailed history of the movement to limit production to reasonable market demand in Oklahoma see: W. P. Z. German, "Legal History of Conservation of Oil and Gas in Oklahoma," Legal History of Conservation of Oil and Gas, A Symposium (Chicago: American Bar Association, Section of Mineral Law, 1938), pp. 126-34; Summers, II, pars. 87, 88, pp. 2-23.

[67] The amendment removing earlier existing authority to prevent "economic waste" was passed by the Forty-First Legislature. Texas Civil Statutes (Vernon, 1929), Art. 6014.

[68] MacMillan v. Railroad Commission of Texas, 51 F. 2d 400 (W.D. Tex., 1931).

ruling was contested in the Danziger case[69] but ultimately upheld.[70] The issue became irrelevant after 1932 when the Texas Legislature passed an amendment explicitly ordering the Commission to limit production to reasonable market demand.[71] The Commission did not immediately succeed in restricting production because some of its orders were invalid on equity grounds. It was not until the decision in the Amazon case in 1934 that the Commission was able to be sure of the legality of both its goals and methods.[72] "After the decision in the Amazon case the Commission held a strong position. It had legal authority to limit production to existing market demand; it had demonstrated that limitations upon production did prevent physical waste; and its orders apportioned allowable production upon a basis satisfactory to the courts."[73]

Though the pattern varied in detail, the legislative and judicial authorization to limit production to reasonable market demand in jurisdictions other than Texas and Oklahoma presented the same picture in outline. Reasonable market demand regulation as a means of stabilizing the oil industry received general approval, along with other statutes that substituted social control for operation of the free market in petroleum production. "It is now settled that any provision which bears a reasonable relationship either to conservation of these natural resources or to the adjustment of correlative rights of the owners thereof or to both, is valid."[74]

One limitation to reasonable market demand regulation might be mentioned before the discussion moves to gas conservation by minimum

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[69]Danziger Oil and Refining Co. of Texas v. Railroad Commission of Texas, 49 S.W. 2d 837, 842 (Tex. Civ. App. 1932); 56 S.W. 2d 1075 (Sup. Ct. Tex. 1933).

[70]Railroad Commission v. MacMillan, 287 U.S. 576 (1932).

[71]Texas Civil Statutes (Vernon, 1948), Art. 6029 d.

[72]Amazon Petroleum Corporation v. Railroad Commission of Texas, 5 F. Supp. 633 (D.C. Tex. 1934).

[73]Summers, II, par. 96, p. 66.

[74]Masterson, "A Survey of Basic Oil and Gas Law," p. 220.

price fixing. Reasonable market demand regulation was generally not applied to marginal production. The Texas statute exempting marginal wells from proration or other restriction to reasonable market demand was passed in 1931.[75] The Kansas law was drafted to apply to pools rather than to individual wells in that it stated that those pools producing less than a certain minimum per day on open flow were not to be restricted.[76] The Louisiana law had the same effect as that operative in Texas, but again the method used was different. The minimum well proration exemption was related directly to underground waste: "[Proration] shall be made on a reasonable basis, giving, to each field with small wells of settled production, an amount which will prevent a general premature abandonment of the wells in the field."[77] From restrictions on physical output as a conservation device we now turn to another method to limit gas use, minimum price legislation.

Gas Conservation Through Minimum Price Fixing

Minimum price statutes setting a minimum price at which natural gas might be removed from the reservoir have been adopted in various jurisdictions. The avowed intent of these statutes has been to conserve natural gas. Minimum pricing to regulate natural gas, rather than production restriction, as in oil, has been advocated because of the differences between the substances. The price influence of production restriction can spread more evenly and rapidly from the impact point for liquids than for gas because of the flexibility of liquid transportation compared to the fixed nature of gas pipeline connections.

Several conservation reasons for minimum price legislation have been given. In its most direct effect, the floor under gas price, if it were not set so low as to be meaningless, would raise gas prices at the

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[75] Texas Civil Statutes (Vernon, 1948), Art. 6049b.

[76] Kansas General Statutes, Annotated, 1949, Edited by Franklin Corrick, c. 55, par. 703.

[77] Louisiana Revised Statutes of 1950, Vol. III, Title 30, par. 11, sec. A.

time of severance above what they would otherwise have been. The higher gas price would presumably reduce the attractiveness of gas as compared to other fuels, and therefore reduce total gas consumption. Gas waste would also be reduced because the higher price of gas to the producer would justify greater expenditure to prevent venting or flaring, if there were an outlet at the higher price. A minimum price law would substitute the judgment of the regulatory body for the price under laissez faire. The effect of minimum prices presumably would be to stretch out the time over which the gas would be produced.

In addition to changing the allocation of gas over time, minimum prices for gas were expected to protect correlative rights by assuring the producer an equitable price. Ratable taking statutes did not protect a producer under some circumstances. For example, if an owner of a portion of a reservoir also controlled the marketing outlet, such as a natural gas stripping plant, he could offer to purchase from other producers at a below market price. In this way the requirement to offer to take ratably would be fulfilled. The other producers would then be faced with the alternatives of selling at a low price or being drained of reserves. Minimum price regulation was therefore required to maintain equity among producers.

Oklahoma experience with minimum price legislation

Oklahoma has been the most active jurisdiction in establishing minimum wellhead prices for natural gas. The authority for the setting of prices was found in Title 52, #233, Oklahoma Statutes Annotated. The relevant portion of the paragraph read as follows:

> [Any person must take ratably] upon such terms as may be agreed upon between said owners and the party taking such, or in case they cannot agree at such a price and upon such terms as may be fixed by the Corporation Commission after notice and hearing; . . .[78]

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[78] 52 Oklahoma Statutes Annotated, par. 233, p. 105.

Actions of the Corporation Commission based on this statute were first tested and upheld in Cities Service Gas Co. v. Peerless Oil and Gas Co.[79] The Oklahoma Supreme Court found state minimum price fixing a legitimate conservation device and one necessary for the protection of correlative rights. In this same opinion the Court also approved the orders issued by the Corporation Commission as sufficiently certain and clear for price fixing purposes. Reasonableness and relevancy were the major criteria for validity of price fixing orders, the Court held, and therefore so long as price control was relevant and neither arbitrary nor discriminatory it was not an unwarranted interference with individual liberty. The commerce clause of the federal Constitution was not considered a bar to state regulation of local prices for legitimate local reasons, even though the product regulated was destined for interstate delivery.[80]

The Supreme Court of the United States upheld the price fixing authority of the Oklahoma Corporation Commission in the case also styled Cities Service Gas Co. v. Peerless Oil and Gas Co.[81] The Supreme Court specifically considered the question of the potential burden that state minimum price legislation might exert on interstate commerce. The opinion included the following passage:

> It is now well settled that a state may regulate matters of local concern over which federal authority has not been exercised, even though the regulation has some impact on interstate commerce . . . The only requirements consistently recognized have been that the regulation not discriminate against or place an embargo on interstate commerce, that it safeguard an obvious state interest, and that the local interest at stake outweigh whatever national interest there might be in the prevention of state restrictions.[82]

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[79] Cities Service Gas Co. v. Peerless Oil and Gas Co., 220 P. 2d 279 (Sup. Ct. Okla. 1950).

[80] Ibid., pp. 279-281.

[81] Cities Service Gas Co. v. Peerless Oil and Gas Co., 340 U.S. 179 (1950) and similar case Phillips Petroleum Co. v. Oklahoma, 340 U.S. 190 (1950), argued at the same time.

[82] 340 U.S. 179, 186-187.

Kansas experience with minimum price legislation

The natural gas conservation statutes of Kansas did not specifically grant the Corporation Commission of that state the authority to establish minimum prices for wellhead sales of natural gas.[83] The generally written law which provided authority to protect correlative rights and conserve natural gas was interpreted as being broadly enough conceived to include power to set minimum prices. The leading case on this issue was Kansas-Nebraska Natural Gas Co. v. State Corporation Commission, which ruled on the question in these terms:

> Our statute gives the Corporation Commission authority to make an order fixing a minimum wellhead price for natural gas taken from a common source of supply if the evidence before the Commission justifies its conclusion that such an order is necessary in order to prevent waste and to secure the relative rights of owners of real property from which gas is produced from a common source of supply.[84]

Federal-state conflict over gas price regulation

The initiation of federal jurisdiction over the field price of natural gas under the 1954 Phillips decision raised the question of federal-state conflict over gas pricing. The Kansas Supreme Court distinguished the jurisdictions of the states and the federal government by defining the Kansas minimum pricing law as regulation of physical production under which gas could not be removed from the reservoir except that the precondition of a minimum price be met. The federal regulation under the Natural Gas Act, on the other hand, was regulation not of production but of sale for resale, and therefore the regulation was not in

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[83] General Statutes of Kansas, Annotated (1949), ed. Franklin Corrick, c. 55, Art. 7, pars. 55-701 - 55-713, pp. 1508-10; and 1959 Supplement to General Statutes of Kansas, 1949, ed. Franklin Corrick, c. 55, Art. 7, pars. 55-701 - 55-713, pp. 654-56.

[84] Kansas-Nebraska Natural Gas Co. v. State Corporation Commission, 222 P. 2d 704, 705 (Sup. Ct. Kan. 1950).

in conflict since it covered different phases of the industry.[85] The issue was resolved in part by the United States Supreme Court opinion in Natural Gas Pipeline Co. v. Panoma Corporation:

> In these cases Oklahoma has attempted to fix a minimum price to be paid for natural gas, after its production and gathering has ended, by a company which transports the gas for resale in interstate commerce. We held in Phillips Petroleum Co. v. Wisconsin, 347 U.S. 672, that such a sale and transportation cannot be regulated by a State but are subject to the exclusive regulation of the Federal Power Commission.[86]

The result of the judicial review of state minimum pricing authority has been to leave the states unhampered in regulating gas at the wellhead as a precondition for production. Regulation of the sale of gas destined for interstate commerce remains the exclusive province of the federal government. For the most part, state minimum prices have not been established high enough to raise the general level of field prices, but have primarily sought the elimination of gross inequities and discrimination. The general escalation of field prices has reduced the impact of the state minimums and has lessened the possibility of state-federal conflict over gas price.

Production Regulation in Retrospect

The regulation of the production of petroleum on the state level, in its operation, has benefited the producing industry as a whole. The actions taken to achieve the major goals of production regulation, protection of correlative rights, conservation of fuel resources, and prevention of economic waste, generally were beneficial to the industry. These activities led to increased economic welfare through greater efficiency in production, to higher prices for the producers in the short run because of restrictions on supply, and to changes in the distribution of income within the producing sector. Production regulation, for this

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[85] Cities Service Gas Co. v. State Corporation Commission, 304 P. 2d 528, 535 (Sup. Ct. Kan. 1957).

[86] Natural Gas Pipeline Company v. Panoma Corporation, 349 U.S. 44, 44-45 (1958).

reason, has had the support of the majority of the producing industry, though specific regulations were opposed by certain elements of it. This regulation has provided a precedent for other regulation which followed and, by altering market relations, has created a justification for other, compensatory, adjustments.

Regulation of the petroleum industry to protect consumer interests has not enjoyed such industry support. The regulation of the sale of gas for resale in interstate commerce, the transportation of natural gas interstate, and the sale of natural gas in the localities has in general been opposed by the industry representatives. This regulation, however, has rested on the very industry conditions created by state production regulation. It is this basic structure of the industry which has been analyzed and described in this chapter. With this necessary background we can now turn to Chapter III and a discussion of the regulation of distribution, interstate transportation, and integrated production of natural gas.

CHAPTER III

REGULATION OF THE DISTRIBUTION, TRANSPORTATION, AND INTEGRATED PRODUCTION OF NATURAL GAS

Social regulation of the distribution, transportation, and integrated production of natural gas was motivated by a desire to protect ultimate consumers from exploitation, as contrasted to the producer oriented regulation of production on the state level. Regulation of this type concerned itself primarily with determining appropriate compensation for services rendered for the consumer. In this sense the seemingly different aspects of the natural gas industry considered here are joined around a common problem. Conflict arose over these determinations because the service charges selected affected the intergroup distribution of income. Other aspects of public policy were involved, though to a lesser extent.

Regulation of the distribution and transportation segments of the gas industry are considered in this chapter. The transportation phase of the industry includes the production of natural gas by the transporting firm. Each of these aspects of the industry is discussed as it relates to the question of regulation of the field sales of gas by independent producers for resale. In terms of the central concern of this study, several purposes are served by consideration of these topics. This examination provides the technical and institutional background necessary for an understanding of the effect the transportation and distribution phases of the natural gas industry have on the regulation of field sales for resale in interstate commerce. The carry over of regulation on one level to regulation on others is examined. Regulation at the distribution and transportation levels is further shown to be insufficient to achieve the public interest. The extension of

regulation to the field sales contract rests on this presumption. Finally, regulation of the integrated producers of natural gas provided the experience on which both the regulators and the regulated drew when independent producer regulation became an issue. For this reason the later portions of this study are brought into sharper focus through knowledge of the matters discussed below.

The first topic dealt with below is distribution regulation. The jurisdictional difficulties involved in regulating city gate prices are considered next. The regulation of transportation of natural gas, which arose from the inability of the cities and consuming states to satisfactorily control prices at the city gate, was initiated by the passage of the Natural Gas Act. An analysis of the contents of that Act follows a description of the events leading up to its passage. The fifth portion of the chapter summarizes the origin of FPC regulatory policy and the regulation of the transportation of natural gas under the Natural Gas Act. The final section deals with the problems presented by the regulation of integrated production.

Regulation of the Distribution of Natural Gas

Distribution regulation has meant the social control of the price and service terms under which gas was moved from the manufacturing plant or city gate to the consumer for heating, cooking, cooling, lighting, or other uses. The freedom of contract for the gas distributor and the consumer has been abrogated by government regulation and replaced by a central rate-making and service-defining contract between the gas company and the civil authorities. The nature of the gas distribution industry was instrumental in leading to the initiation and acceptance of such regulation.

The Nature of the Gas Distribution Industry

Gas distribution as a major industry originated with manufactured gas. The manufacturing plants, owned most often by the distributing company itself, converted coal or oil into gas through a hydrogenation

process. The manufactured gas from the central plant was then conducted through mains, under low pressure, to the ultimate consumer. The coming of natural gas did not materially affect the operation of the gas distribution companies but merely substituted the transporting line at the city gate for the earlier manufactured source of the product. Natural gas had a higher energy-volume ratio than the manufactured gas but the two could be mixed to provide satisfactory peak service. Manufactured gas facilities have only gradually been eliminated, and even in 1960 some manufactured gas was produced, primarily to meet peak loads.

A distribution concern does not face a domestic consumer who is devoid of alternatives, but the existing competitive market discipline from other fuels and other products is relatively weak. There are many fuels available which can supply energy but the nature and form of gas are such as to make it preferred, if not obligatory, in certain uses. Electricity, while an efficient substitute, is considerably more expensive than gas in most areas. Moreover, for most domestic gas consumers, use of other fuels would be impossible except after an expensive conversion and replacement of appliances. Significant substitution within reasonable price ranges would be limited in the short run if fuel shifts rested on the recurrent replacement decisions taken by the consumers as a whole.[1] The other principal alternative of the consumer, interindustry competition from insulation, is probably of little importance.[2]

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[1]No significant studies of the elasticity of demand for gas from the distributing utility with reference to residential or commercial demand are available. Of course the demand for gas as industrial boiler fuel exhibits considerably different characteristics since many firms maintain duplicate fuel facilities to take advantage of discrepancies between fuel prices even in the short run. Since our concern is with distributing utilities rather than with direct sales to industrial users, the latter portion of the industry will be ignored in the present context. One study with some application at this point is reported in J. B. Vermetten and J. Plantinga, "The Elasticity of Substitution of Gas with Respect to Other Fuels in the United States," Review of Economics and Statistics, XXXV (May, 1953), pp. 140-43.

[2]This second point has become important as a legal as well as an economic factor, especially since the Supreme Court decision in the DuPont cellophane case. United States v. E. I. duPont de Nemours & Co., 118 F. Supp. 41 (D. Del. 1953); United States v. E. I. duPont de Nemours

The economics of the gas distribution industry leads to a breakdown in direct distribution competition. This factor has contributed to the acceptance of social control of the industry. Distribution mains make up a very large portion of total gas utility physical investment. In turn, the cost of gas service to a large extent is made up of investment costs. Unit cost of service, then, falls directly and significantly with increased load density. The marginal cost of serving a consumer along an existing line is very small compared to the average cost of service. Under these circumstances competition, where tried in gas distribution, broke down in violent but short lived price wars.[3] For these reasons gas distribution is included in the category of industries labeled natural monopolies. While the term natural monopoly has been used in the literature in both normative and positive contexts, here it shall refer to an industry where competition leads to its own destruction for technical and economic reasons. Therefore a judgment that an industry suitably defined with reference to accessible consumer alternatives is a natural monopoly does not automatically imply the necessity of regulation. The absence of competition along with the inability to foster such competition might or might not lead to the further judgment that regulation was necessary to protect the consumer. This last judgment would flow from the value orientation of the evaluator and from the circumstances of the case.

Development of the Regulation of Gas Distribution

Traditional acceptance in Western thought has been given to the proposition that industries falling in the category of natural monopoly were subject to the possibility of government regulation. In addition,

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& Co., 351 U.S. 377 (1956). For a thorough discussion of this case see George W. Stocking and Willard F. Mueller, "The Cellophane Case and the New Competition," reprinted in Heflebower and Stocking, A.E.A. Readings in Industrial Organization and Public Policy, Vol. VIII (Homewood, Ill.: Irwin, 1958), pp. 118-50.

[3] C. Woody Thompson and Wendell R. Smith, Public Utility Economics (New York: McGraw-Hill Book Company, Inc., 1941), pp. 93-95.

two further contentions were used to support the desirability of regulation of gas distribution firms. The distribution of gas was an essential service the restriction of which would cause severe community dislocation, not mere personal inconvenience. Further, a relationship of dependence was said to exist between the consumers and the gas distributor because, on the basis of the firm's holding itself out to serve, the consumer adjusted his own affairs to the consumption of gas. For these reasons the idea of government regulation of gas distribution has been generally accepted.[4]

The right of government to regulate a monopoly affected with the public interest was established independent of the particular matter of the regulation of the distribution of gas to consumers. The gas distribution regulation controversy concerned the applicability of accepted doctrine to the industry, not the question of government-business relations. One of the leading cases on this subject upheld the public service nature of gas lighting.[5] Since the gas light business was a public service it was held to be subject to the police power of the state, following the Slaughter-House decision.[6] The police power of the state could not be granted away, and therefore the state retained at least potential control over the gas company.

> For as we have seen, the manufacture of gas, and its distribution for public and private use by means of pipes laid, under legislative authority, in the streets and ways of a city, is not

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[4] A study of the development of the philosophy and practice of regulation of economic activity was prepared by this writer in earlier stages of the work on the regulation of the natural gas industry. Space considerations prevented its being included in the present work.

[5] New Orleans Gas Company v. Louisiana Light Company, 115 U.S. 650 (1885). The major point of contention here regarded the granting of a franchise to one company and its withdrawal some fifty years following, on expiration, and reletting to another firm. While the ability to grant a gaslight franchise was not contested, the authority of the state in removing the franchise was. Hence the necessity for determining the public nature of the service performed.

[6] The Butchers' Benevolent Association of New Orleans v. The Crescent City Livestock Landing and Slaughterhouse Company, 16 Wallace 36 (1872). (Referred to as the Slaughter-House Case)

> an ordinary business in which every one may engage, but is a franchise belonging to the government, to be granted, for the accomplishment of public objects, to whomsoever, and upon what terms it pleases. It is a business of a public nature, and meets a public necessity for which the State may make provision.
> . . . . . .
> . . . [The] State, or . . . the municipal government of New Orleans acting under authority for that purpose [can] establish and enforce regulations which are not inconsistent with the essential rights granted by plaintiff's charter, which may be necessary for the protection of the public against injury whether arising from the want of due care in the conduct of its business, or from an improper use of the streets in laying gas pipes, or from the failure of the grantee to furnish gas of the required quality and amount.[7]

The obligation of a gas distributor to render service to all seeking it was upheld by the Supreme Court of Indiana in 1901.[8] Here the special grant of eminent domain and license to use the streets and alleys for distribution lines was offered as supporting reasoning demanding an area saturation policy. The company, operating under prices set by ordinance in the city of Indianapolis, stated that it did not have sufficient gas to extend its service to new customers and to maintain service to its old customers.[9] The company's pleading was rejected and it was ordered to serve all customers desiring connection in reasonable proximity to the mains.[10]

The above decisions, and other sources such as the opinion of the Justices of the Massachusetts Supreme Court,[11] placed the business of distributing and manufacturing gas in the category of an economic

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[7] 115 U.S. 650, 669, 671.

[8] State v. Consumers' Gas Company, 157 Ind. 345 (1901).

[9] Ibid., p. 348.

[10] Ibid., pp. 349-350. "There can be no such thing as priority, or superiority, of right among those who possess the right in common." Thus it was also impossible for the company to set up priorities which excluded some potential customers. (Ibid., pp. 353-354.)

[11] Opinion of the Justices, 150 Mass. 592 (1890). The Justices of the Supreme Court of Massachusetts were asked by the Massachusetts House of Representatives if a bill authorizing cities and towns to build and maintain gas plants was constitutional. The Justices replied that it

activity which the states and localities could regulate in the interest of protecting the consumers from exploitation. By restrictive franchises, city ordinance, and legislative statute, public control over this business was extended to such factors as price, service conditions, and safety obligations. The traditional cost-of-service method was found satisfactory and approved as a basemark for establishing service rates.

The regulatory formulas and methodology in the industry were worked out before the advent of natural gas but change of source did not create any basic problems in controlling the distributing firms. The changeover removed the source of the distributed commodity from the distributing utility and similarly moved it away from the jurisdiction of the regulatory agency. While the regulatory agency had not controlled the price of the raw materials that went into manufactured gas, these materials were purchased in an essentially competitive market, as contrasted to gas purchased from a single long distance transmission line. Since the cost of gas as it entered the city gate was passed on to the consumer, and since this price was monopolistically determined, after the change to natural gas regulatory authorities found themselves unable to certify that consumers were receiving gas at the lowest cost consistent with maintenance of supply. The problem of controlling gas prices at the city gate led to the consideration of transmission regulation.

Regulation of City Gate Prices and Jurisdictional Conflict

The price of gas at the city gate is the sum of two different prices, the price of the gas at the wellhead and the cost of gathering,

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was, and that moreover though the House did not ask, it was also within the powers of the legislature to authorize the cities and towns to levy taxes for the establishment of such facilities. The Justices relied on numerous cases justifying public ownership of such facilities as fire fighting equipment, water works, etc., as being in the public interest and therefore capable of being supported by public entities without the taxation therefore being a violation of requirements against taking private property without compensation, nor against taking private property for non-public use. They then held that gas facilities were analogous, and therefore the proposed measure within the competence of the Legislature.

processing, and transporting the gas from the wellhead to the city gate. In the early era of the use of natural gas by cities, approximately up to 1926, most gas was used near the point of production. The total industry was generally within the geographic limits of the consuming state, and until the development of long distance transmission most often a single firm produced, transported, and distributed the fuel. With the development of the large natural gas fields capable of supplying vast quantities of gas, however, and with the coming of economically acceptable long distance transportation technology, the production and transportation phases of the natural gas industry came more and more to be separated from distribution, both geographically and corporately.

Interpretation of Federal and State Jurisdiction

Local regulation of the distribution of natural gas produced in other states came face to face with the anomaly that has influenced the development of so much of the law of the United States, the division of sovereignty between the federal and the state governments. The division of jurisdiction is rooted in the Constitution, but the Constitution does not make the boundaries between authorities clear. The center of confusion has been the area between the commerce clause and the Tenth Amendment. The commerce clause reads: "[The Congress shall have power] to regulate Commerce with foreign Nations, and among the several States, and with the Indian Tribes."[12] The Tenth Amendment reserved non-enumerated powers to the states and to the people. "The powers not delegated to the United States by the Constitution, nor prohibited by it to the States, are reserved to the States respectively, or to the people."[13]

The first leading opinion on this question was issued in Cooley v. Board of Wardens.[14] The rule from this case was that if the effect of

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[12]U.S., Constitution, Art. 1, sec. 8.

[13]U.S., Constitution, Tenth Amendment.

[14]Cooley v. Board of Wardens, 12 Howard 299 (1851).

a state act on interstate commerce was merely incidental to the accomplishment of some justified end by the state, the act was valid unless Congressional action specifically supplanted it. The federal government therefore did not have exclusive jurisdiction over interstate commerce. In the case of substantive regulation of interstate commerce or regulation that would unduly burden or interfere with interstate commerce, the states were powerless whether or not Congress had acted. It later developed, parenthetically, that Congress had similar rights with reference to intrastate commerce. As held in the Shreveport Rate Cases, the federal government could regulate intrastate commerce, but only in so far as was necessary to remove unjust discriminations against or interruptions of interstate commerce.[15] Cooley v. Board of Wardens initiated a schematic division of authority which was maintained with varying boundaries. Three situations were distinguished: intrastate commerce, where the federal government had authority only in so far as interstate commerce was adversely affected; interstate commerce relating to matters of local concern where the local authorities could act up to the time the federal government exerted its jurisdiction, so long as regulation was not unduly burdensome to interstate commerce; and finally, interstate commerce which was national in character and admitted of only national control.[16]

A clarification of the Cooley case of direct interest to the regulation of natural gas resulted from Peik v. Chicago and North-Western Railway Company.[17] One issue in question was the power of

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[15]Houston, East and West Texas Railway Company v. United States, 234 U.S. 342, 343 (1914). "While Congress does not possess authority to regulate the internal commerce of a state, as such, it does possess power to foster and protect interstate commerce, although in taking necessary measures so to do it may be necessary to control intrastate transactions of interstate carriers." (Referred to as Shreveport Rate Cases.)

[16]Kenneth F. Burgess, "The Twilight Zone Between the Police Power and the Commerce Clause," 15 Iowa Law Review 162, 165 (1930).

[17]Peik v. Chicago and North-Western Railway Company, 94 U.S. 164 (1876).

Wisconsin to regulate a railway operating in interstate commerce. The court held:

> The law is confined to state commerce, or such inter-state commerce as directly affects the people of Wisconsin. Until Congress acts in reference to the relations of this company to inter-state commerce, it is certainly within the power of Wisconsin to regulate its fares, etc., so far as they are of domestic concern. With the people of Wisconsin this company has domestic relations. Incidentally, these may reach beyond the State. But certainly, until Congress undertakes to legislate for those who are without the State, Wisconsin may provide for those within, even though it may indirectly affect those without.[18]

Following the Peik decision, the authority of a state in the absence of Congressional action seemed clear. But the Peik decision had stood only ten years when the Wabash case ended the possibility of effective state regulation of interstate commerce.[19] The Court defined those areas in which the states were competent to act in the absence of federal legislation as excluding the control of rates and conditions of service of an interstate carrier, even with reference to service within the state.

Interstate Jurisdiction Over Natural Gas

Attempts of states and localities to exert control over production and transportation of natural gas in interstate commerce were consistently rebuffed in a series of cases culminating in the Supreme Court.[20] Though the Court need have gone no further than a recitation of the commerce clause to strike down state and local regulation of this sort, many of the decisions also discussed public policy implications of state regulations. Some of the decisions took on importance in their own light because of the arguments used.

The emphasis on the unity of the nation's economy was one theme running through the Court decisions. According to this view, each

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[18] Ibid., p. 178. (Emphasis supplied.)

[19] Wabash, St. Louis and Pacific Railway Company v. Illinois, 118 U.S. 557 (1886).

[20] Only a few of the major decisions are mentioned here.

state's resources were held to the benefit of the nation. If one state were allowed the privilege of regulating the conditions under which its resources could enter into interstate commerce then all could, and instead of free transfer of resources between states and regions, pernicious and divisive trade barriers could be established. Natural gas, the Court held, was no different than other products.[21] Regulation by a number of authorities would burden interstate commerce with varying regulations and limitations so restrictive as to destroy many of the benefits of such commerce. In the leading case holding state regulation of natural gas transportation in interstate commerce unconstitutional, the Court stated:

> The paramount interest is not local but national, admitting of and requiring uniformity of regulation. Such uniformity, even though it be the uniformity of governmental nonaction, may be highly necessary to preserve equality of opportunity and treatment among the various communities and States concerned.[22]

The interstate nature of gas shipments across state lines prevented the individual states from levying a tax on the interstate portion of the business.[23] Taxation was found to be by nature an unreasonable burden on interstate commerce. Direct regulation of rates charged by firms in interstate commerce was forbidden the states on the same reasoning. An exception was made, however, in cases where a community of interest existed between the distributing companies and the transportation company in interstate commerce. In the absence of

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[21]This question was at issue in: West v. Kansas Natural Gas Company, 221 U.S. 229 (1911); and Pennsylvania v. West Virginia, 262 U.S. 553 (1923). The right of states to make and enforce any of the petroleum conservation laws might just as easily be challenged under this same interpretation. If resources are held for the benefit of the nation, the regulation of their allocation by individual states seems contradictory. While parenthetical at this point, this issue might predictably arise in the future.

[22]Missouri v. Kansas Natural Gas Company, 265 U.S. 298, 309-310 (1924).

[23]United Fuel Gas Company v. Hallanan, 257 U.S. 277 (1921); East Ohio Gas Co. v. Tax Commissioner of Ohio, 283 U.S. 465 (1931).

presumptive arm's-length negotiation for gas at the city gate, the regulators of the local service were allowed to go beyond the face of the distributor's contract with the pipeline.[24]

The regulation of the interstate transportation of natural gas passed beyond the jurisdiction of the states with these court decisions. The powers of the states remained undiminished with reference to purely intrastate business, but the effectiveness of such regulation took on more and more of the tone of mockery due to the change in the industry from manufactured to imported natural gas. The rates charged the local distributors were built into the price charged consumers, and the states were powerless to influence these rates. Only the federal government was competent to act, and it did not choose to exercise its competence. A "regulatory gap" between producer and consumer was created because of a lack of state power and the inaction of the federal government.

Initiation of Federal Regulation of Interstate Transportation of Natural Gas

The decision that state and local jurisdiction did not stretch to interstate transportation of natural gas left this industry unregulated because of the absence of federal activity in the field. Consumer representatives did not press their efforts at closing the regulatory gap through federal action until the middle of the 1930 decade. The reasons for this relative inactivity might be presumed to include, among others, the mood of a time of big business ascendency, general optimism and prosperity, the relative stability of household gas prices, the discovery of vast supplies of natural gas which kept the field price of the fuel relatively constant, the technological development in the transmission industry which lowered absolutely the cost of gas transmission, and perhaps most importantly, the relative unimportance of natural gas transported interstate in all but a few important consuming centers.[25]

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[24] Western Distributing Co. v. Public Service Commission of Kansas, 285 U.S. 112 (1932).

[25] See Tables C and G in the Appendix for data supporting these conclusions.

Whatever the cause of the relative quietude among consumers before the business depression, it disappeared in the agitation that culminated in the passage of the Natural Gas Act of 1938.

Factors Leading to Demands for Federal Regulation

The demand for regulation cannot be explained by a significant increase in the price of gas. The absolute increase in the domestic and commercial price of natural gas on the average was not large between 1929 and 1938 and for the period 1932-1938 the prices were all but stable.[26] During this period the proportion of gas going into interstate commerce rose from approximately 21 per cent to 28 per cent. The presumed average increases in the transmission distance for gas meant that there was a different "product mix" at the later time which would explain a moderate relative increase in domestic and commercial prices of natural gas.[27]

The relative stability of delivered natural gas prices in the face of the overall decline in prices with the general depression in economic activity might have been the source of the dissatisfaction with the price performance of the natural gas industry. During the period between 1928-1930 and 1938-1939 the consumer price level fell from 120 to 100 (1937-1939 base) while the domestic and commercial price of natural gas went from about 92 to 100 during the same time period.[28] An

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[26]For data see Table H in the Appendix. Information calculated from data found in U.S. Department of the Interior, Bureau of Mines, Minerals Yearbook (Washington: U.S. Government Printing Office). Various dates. It must be noted that any analysis of this type using average figures over a highly diverse industry can only be considered suggestive. Within limits, however, such comparisons can be useful. When the further extension of interpretation of the data to political effects is made the geographical and ideological distribution of political power must be considered.

[27]For data see Table B in Appendix. Information calculated from Minerals Yearbook, various dates.

[28]Data on consumer price index calculated from the Bureau of Labor Statistics estimates published by U.S. Department of Commerce, Bureau of the Census, Historical Statistics of the United States,

algebraic change of less than 30 index points over a nine year time period between the general price level and the gas price probably was not so great in itself, however, as to bring severe political repercussions. Moreover, the cost rigidity following from the fixed or contractual nature of a significant proportion of gas costs could have been used to explain some of the pricing patterns and should have served to deflect some criticism at least. Nevertheless, gas regulation came from agitation arising during this period.

A combination of three factors helps to explain the political pressure for gas regulation after a period of apparent apathy and in spite of relative overall stability of gas prices.[29] First, the changing but spotted geographic pattern of use, accompanied by increased quantities of gas carried interstate, left national measures of industry performance unrepresentative of what was happening in specific markets. For example, the preponderance of gas used in producing regions at very low and sometimes falling prices overshadowed the rise in gas prices in the new consuming markets. Moreover, the absolute increase in the use of gas caused its price, whatever the level, to be of greater concern to more people.

The public image of the utilities and of big business generally became tarnished with the end of prosperity and the advent of the depression. The public's suspicious and hostile attitude was decisively reinforced by investigations of business practices which exposed wrongdoing. These disclosures came with greater built-in credibility because of the great expectations of benefit from natural gas. The wastage of gas in the fields and the very low producer prices had been well publicized good omens to the northern and eastern consumer. When wrongdoing

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Colonial Times to 1957 (Washington: U.S. Government Printing Office, 1960), pp. E 113-39. Data on change in price of domestic and commercial gas used taken from Minerals Yearbooks, various dates. See Table H in the Appendix.

[29]These conclusions were reached by the writer after examination of diverse sources, including Congressional investigative reports, hearings on the proposed regulatory measures, and periodicals. In the writer's opinion, the variety of the sources and the impressionistic nature of the conclusions make specific citation both impossible and nonproductive.

in the utility industry came to light, the public was prepared to compare actual prices with expected prices, rather than with prior experience with gas and other fuels.

The service record of the natural gas industry was a final source of public disfavor. The charge was made that vested interests in manufactured gas prevented full exploitation of the natural gas potential. As the FTC final report stated, "Monopolistic control permits the curtailment of production of a better product at lower prices and protection of an inferior product at higher prices."[30] Collusive agreements to respect territories designated for other firms in the industry, though not yet served by them, were also aired. Conversely, some regions favored by early service feared that expansion of service area would jeopardize their own future supply of gas because of inadequate committed reserves. The waste involved in the occasional parallel lines was also roundly condemned. Whatever the motives and sources of impetus, the question of federal regulation of the natural gas industry became topical during the 1930's. One result of political interest in gas transportation regulation was the formation of panels to investigate the industry.

Investigations of the Natural Gas Transportation Industry

Two studies prepared the public for federal regulation of the natural gas industry and did much to influence the direction that regulation was to take. The first of these, conducted by the Federal Trade Commission, began in 1928. It was aimed primarily at the holding company device and its use in the electric power industry.[31] The second

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[30]U.S., Congress, Senate, Federal Trade Commission, Utility Corporations: Final Report to the Senate of the United States on Economic, Corporate, Operating, and Financial Phases of the Natural Gas Producing, Pipe-line, and Utility Industries, with Conclusions and Recommendations, Document 92, Part 84-A, 70th Cong., 1st Sess., 1936, p. 600. (Hereinafter referred to as FTC, Utility Corporations.)

[31]U.S., Congress, Senate, Senate Resolution 83, 70th Cong., 1st Sess., 1928, and extended by U. S. Senate, Senate Joint Resolution 115, 73rd Cong., 2d Sess., 1934. The Federal Trade Commission made monthly

of these studies was conducted under the auspices of the Commerce Committee of the House of Representatives. Walter M. W. Splawn was the director of the House study, and the reports issued were referred to under his name. The first Splawn report was submitted in 1931 and covered railroads.[32] The second, issued in 1934, dealt with power and gas company organization.[33] Though the subject matter of the Federal Trade Commission investigation and the Splawn study overlapped somewhat, there was a conscious attempt to avoid duplication.

The Federal Trade Commission Report

The FTC conclusions following its study of the transmission phase of the natural gas industry were that gas transmission exhibited characteristics which could and did lead to the exploitation of consumers and of independent producers. The basic recommendation was that the high degree of market power possessed by the pipelines should be curbed by federal regulation. The FTC also found that integration between the transmission lines and distributors raised regulatory problems for the states and localities. The following passage from FTC, Utility Corporations is illustrative:

> Natural gas starts with the mining of a fugitive, unstable, nonstorable commodity which is a wasting, nonreplaceable natural asset recovered in limited areas, quite generally at considerable distance from the actual and potential consuming markets. The demands and needs are practically country-wide. The situation

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reports to the Congress and prepared other exhibits. The study lasted for eight years, with the final report issued December 31, 1935.

[32]U.S., Congress, House, Committee on Interstate and Foreign Commerce, Regulation of Stock Ownership in Railroads, pursuant to H.R. 114, 71st Cong., 3d Sess., 1931.

[33]U.S., Congress, House, Committee on Interstate and Foreign Commerce, Relation of Holding Companies in Power and Gas Affecting Control, Parts I-VI, 73d Cong., 2d Sess., 1934, H.R. 827. This report was prepared under the direction of Walter M. W. Splawn, special counsel, and the reports together are generally and hereinafter referred to as the Splawn Reports. Part II contains the general summary, recommendations, and a legal study. Part IV contains an introductory chapter prepared by the Bureau of Mines on the natural gas industry.

> often ends after interstate transportation through pipe lines, none of which holds itself out as a common carrier or public utility, regulatable as such. The plea of interference with interstate commerce generally is advanced by the interstate pipe-line companies as a defense against their regulation as public utilities by the several States.
>
> Gas and pipe-line companies have asserted in some instances that they are solely within State jurisdiction and in other instances that they are so engaged in interstate commerce as to be entirely beyond State jurisdiction, whichever the exigencies of the particular case might seem to demand. There is a jurisdiction, either State or National, which covers the entire country. Federal jurisdiction plus the jurisdiction of the several States should be so utilized and coordinated as to produce effective regulation and the termination of existing abuses and leave no unregulated twilight zone. Otherwise our system fails in a very crucial situation.[34]

Conservation of natural gas was one of three other problems for which federal remedial action was suggested by the FTC. The transmission companies were found to force the price of natural gas in the field to very low levels. If the independent producers did not sell at the low prices offered by the transmission lines, the transmission companies produced, or threatened to produce, from their own reserves. This action was designed to deny the independent producer a reasonable market and at the same time to drain natural gas to the captive wells from the other portions of the reservoir. To meet this threat to efficient gas production and utilization the FTC recommended state regulation, common carrier or common purchaser status for the pipelines, or ratable taking statutes with a federal back-up law.

The performance of the natural gas industry did not meet the nondiscriminatory standards of public utility operation according to the FTC statement. The "skimming" of high load areas without area saturation was a common complaint among the consumer groups. The FTC recommended that the transmission companies be required to offer service to all cities which could be economically served without prejudice to prior consumers.

The FTC report also recommended separation of the different types of utilities to foster competition. The Commission contended that gas

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[34] FTC, Utility Corporations, p. 612. The recommendations of the FTC are found on pp. 581-617 of its report.

and electricity were partial substitutes and that manufactured and natural gas were even more closely competitive. Given these relationships, the corporate interconnections among the energy companies forestalled healthy competition and led to geographic market segmentation. Complete segregation of the gas and electric industries was desirable, along with strict scrutiny of the two gas segments, in the FTC view.

A major inference from the FTC report was that the independent producer of natural gas during the pre-1935 period required aid, not regulation. Pipeline control of access to markets was thought to put producers at a general disadvantage. The interstate nature of natural gas production was noted throughout the document. Far from questioning the constitutionality of federal regulation of the purchase of natural gas in the field, the Commission recommended it in another context:

> A Federal regulatory law should be enacted applicable to interstate gas pipe lines which transport gas for ultimate sale to and use by the public, regulating contracts for purchase of gas to be transported interstate, or regulating rates for carriage or city gate rates at the end of such transportation, or all of these.[35]

In sum, the conclusion reached in the FTC study was that regulation of interstate transportation of natural gas was necessary for the protection of the consumers, the producers, and the general public. The economics and structure of the industry were found to be such that unregulated enterprise exploited both consumers and producers and threatened the future supply of natural gas. The FTC also criticized unwarranted concentration of control of energy sources, restriction of available alternatives for consumers and producers, and the regulatory gap due to federal inaction.

The Splawn investigation of holding companies

The Splawn investigation concentrated on fields outside the electric power industry and emphasized the relations between holding companies

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[35] Ibid., p. 616. (Emphasis added.)

and operating utilities. Evidence supplied in this report pointed to extensive use of the holding company device in the natural gas industry. No necessary economic reason for vertical integration was established. The success of the device, according to this report, was based on exploitative rather than operational considerations. Federal regulation of wholesale price of natural gas was necessary because only the federal government could meet the need for regulation that the study commission judged existed. It was reported that competitive construction of natural gas pipelines presented a problem in effective resource allocation and in the protection of prior consumers. Certification was prescribed as the method of choice for rationalizing the construction of long distance pipe lines.[36]

Using reasoning not established in law until the Deep South decision,[37] the finding in the Splawn Report was that the production of natural gas, whether destined for interstate commerce or not, was in interstate commerce if any well in the particular reservoir was producing gas dedicated to interstate commerce. The passage bears reproduction because of its applicability to later controversy.

> Natural gas is deposited in a reservoir in the earth which is provided by nature. This reservoir is punctured by a well and the gas then blows through the vent into the air unless the well is shut in. The practice is to connect these wells through systems of pipe with a pipe line. . . . These gas lines are sometimes hundreds of miles in length and in some instances cross several States. The gas from the well connected with such a pipe line flows freely to consumers in the different States served by the gas pipe line. The gas remaining in nature's reservoir is necessary to the propulsion and the movement of the gas through the pipe line. When a gas well is connected with an interstate gas pipe line, that connection places the entire field feeding through the well in interstate commerce.[38]

The FTC and Splawn studies, and the growing demand for regulation of the unregulated segments of the natural gas industry, led to the

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[36] Splawn Reports, Part II, p. iv.

[37] Deep South Oil Co. v. Federal Power Commission, 247 F. 2d 882 (5th Cir. 1957).

[38] Splawn Reports, Part II, pp. iv-v.

passage of the Natural Gas Act, June 21, 1938.[39] This Act closed the previously existing gap beyond the city gate, though whether it pushed gas regulation back to the wellhead was later disputed. Undoubtedly the major focus of the Act was on the interstate transportation companies who produced much of the gas brought to market and who were able to purchase the rest at low prices because of their peculiar market power. The abuses discovered by the investigations preceding the Natural Gas Act emphasized the role of the transmission companies. Events then in the future were to place added importance on the provisions of the Act relating to regulation of the sales for resale of natural gas by producers.

The Natural Gas Act of 1938

The Natural Gas Act of 1938 began in the usual fashion by giving the origin of the Act, stating that such regulation was made necessary for the protection of the public interest and that the studies of the problem pointed to federal regulation as the appropriate solution. The scope of the Act was outlined in the controversial paragraph I (b):

> The provisions of this act shall apply to the transportation of natural gas in interstate commerce, to the sale in interstate commerce of natural gas for resale for ultimate public consumption for domestic, commercial, industrial, or any other use, and to natural gas companies engaged in such transportation or sale, but shall not apply to any other transportation or sale of natural gas or to the local distribution of natural gas or to the facilities used for such distribution or to the production or gathering of natural gas.[40]

Federal regulation of the sale for resale of gas at the wellhead depended on whether the exclusion in the last part of the paragraph referred only to the physical activities of production or referred to the sale of gas produced as well. The question of the applicability of the Act to production and gathering by independent producers was not a

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[39] 52 Stat. 821 (1938); 15 U. S. C. 717-717w.

[40] 52 Stat. 821 (1938); 15 U. S. C. 717 (b).

subject of particular concern at the time the Act was passed.[41] The definitions of the Act set the scope of the firms covered in these words: "Natural-gas company means a person engaged in the transportation of natural gas in interstate commerce, or the sale in interstate commerce of such gas for resale."[42]

In its substantive portions the Natural Gas Act legalized only "just and reasonable" rates. It empowered the Federal Power Commission to enforce these just and reasonable rates by holding illegal any rate or charge that did not fall into this prescribed category.[43] In addition, discrimination was forbidden with the determination of equitable treatment also left up to the Commission.[44] Natural gas companies were required to file such reports as the Commission would prescribe and such reports were to be open to public inspection.[45] The Commission was obligated to institute rate hearings on new rates or on changes of old rates whenever it deemed such action necessary or upon the complaint of an affected party. Suspension of a rate change was authorized during the period of the hearing. Such suspended rates went into effect at the request of the natural gas company if the Commission did not act within five months of the date when the suspension took effect. At the discretion of the Commission the natural gas company was required to furnish bond to guarantee return of all overcharges collected under the vacated suspension if the proposed rates were not approved. The burden of proof as to the reasonableness of any rate change rested on the natural gas company.[46]

If the Commission found that a rate charge or classification "or that any rule, regulation, practice, or contract affecting such rate, charge, or classification is unjust, unreasonable, unduly discriminatory,

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[41] Further consideration of the scope of federal control over natural gas production and the sale for resale of natural gas in the field is delayed to Chapter V below.

[42] 52 Stat. 821 (1938); 15 U. S. C. 717a, sec. 2 (b).

[43] 52 Stat. 822 (1938); 15 U. S. C. 717c, sec. 4 (a).

[44] 52 Stat. 822 (1938); 15 U. S. C. 717c, sec. 4 (b).

[45] 52 Stat. 822 (1938); 15 U. S. C. 717c, sec. 4 (c).

[46] 52 Stat. 823 (1938); 15 U. S. C. 717c, sec. 4 (e).

or preferential, . . . [it] shall fix the same by order, . . ." except that while the FPC could lower a rate it could not raise one. One statement found in this paragraph of the law gave rise to later interpretation issues. Among reasons for lowering a rate was "where existing rates are unjust, unduly discriminatory, preferential, otherwise unlawful, or are not the lowest reasonable rates."[47] This passage caused no questions to arise in regulation of transportation rates, but it was later argued that the "lowest reasonable rate" provision prevented the Commission from adopting a policy of using the field price of natural gas to influence the use rate of the resource over time.

The Natural Gas Act, for rather obvious reasons, pointed to regulation by means of the traditional public utility approach of return of the cost of service. Section 6, though using the verb "may," rather than the stronger "shall," empowered the Commission to ascertain the cost of property of every natural gas company and to determine depreciation and capital improvements and inventory for rate making purposes. The natural gas companies by law were required to file all such information on request by the Commission.[48]

As amended, the Natural Gas Act required the natural gas companies to report all projected changes in service and gave to the Commission the right to deny approval to all abandonments of service. It also allowed the Commission to pass upon all expansions and enlargements of facilities and authorized the Commission to initiate changes in service so long as those changes in service did not jeopardize the service received by prior consumers.[49] Section 7 and Section 8 of the code empowered the Commission to issue certificates of convenience and necessity under the general admonition to make reasonable and just decisions.[50] The code set out in some detail the right of the Commission

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[47] 52 Stat. 823 (1938); 15 U. S. C. 717d, sec. 5 (a).

[48] 52 Stat. 823 (1938); 15 U. S. C. 717e, sec. 6 (a).

[49] 52 Stat. 824 (1938); 15 U. S. C. 717f (a).

[50] 52 Stat. 824 (1938); 15 U. S. C. 717f; 61 Stat. (1947); 15 U. S. C. 717f (b-h); 52 Stat. 825 (1938); 15 U. S. C. 717 g.

to make determinations of the appropriate rates of depreciation. Standardization of these and other accounts was required.[51] The law also provided that the companies furnish such amortization and other cost data as the Commission desired, on either a continuing or irregular basis.[52]

The Commission was granted the power to issue such orders as it deemed necessary. All affected parties to any Commission action were given the right to request a rehearing on any decision. After such a request the Commission might or might not reopen hearings or alter decisions already rendered. The United States Courts of Appeal were given original jurisdiction for all requests for review of Commission actions. Questions not raised before the Commission were not to be argued before the Court. Substantial evidence given before the Commission was to be accepted as conclusive by the Court. After appeal, new evidence could be heard only by the Commission, and then only at the discretion of the Court.[53] Under these general provisions the regulation of the natural gas industry proceeded. The regulation that started with the control of gas street lighting was thus pushed back to cover, under some jurisdiction, portions of the natural gas industry from production to consumption.

Federal Regulation of the Transportation of Natural Gas

The passage of the Natural Gas Act gave the Federal Power Commission the authority to regulate the sale for resale of natural gas in interstate commerce and the transportation of that gas from the producing areas to the interstate consumers. The law did not, however, set forth in any great detail how that regulation was to be conducted, nor did it specifically define a regulatory objective to which the Federal Power Commission was to aspire. The general intent of the law to protect the consumers from exploitation was clear, but it was not clear whether

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[51] 52 Stat. 826 (1938); 15 U. S. C. 717h, sec. 9 (a).

[52] 52 Stat. 826 (1938); 15 U. S. C. 717i.

[53] 52 Stat. 831 (1938); 15 U. S. C. 717 r.

that exploitation was to be defined solely in terms of excessive rates or was to include the whole spectrum of value decisions surrounding the use of any depletable resource. The intent of the law, as it was administered and enforced, directly influenced the results under it. Yet basic regulatory intent was not considered in any extended form until the Natural Gas Investigation several years after the passage of the Act.[54] Meanwhile the job of regulation existed and some methods and at least proximate ends had to be selected. The Commission experience in regulatory matters was important in establishing the early rules under which the authority was administered.

The Federal Power Commission Before the Natural Gas Act

The Federal Power Commission was not called into being for the purpose of regulating the natural gas industry. Instead it was a regulatory agency with a past varied in terms of personnel, organization, and range of authority. The FPC was established June 10, 1920, as a part-time commission made up of the Secretaries of War, Interior, and Agriculture. The duty of this commission was to determine and apply national water power development policy.[55] It did not become an independent commission staffed with full time commissioners until June 25, 1930.[56] Regulatory importance did not accrue to the agency until August 26, 1936, when the Federal Water Power Act was subsumed as Title I of the Federal Power Act. With this law the Federal Power Commission was given jurisdiction over the interstate transmission of electric energy and the companies engaged in that transmission.[57]

The regulation of the interstate transmission of electric energy was conducted on the more or less traditional regulatory pattern of cost

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[54]Federal Power Commission, Natural Gas Investigation, Docket G-580 (Washington: U.S. Government Printing Office, 1948).

[55]41 Stat. 1063 (1920) c. 285.

[56]46 Stat. 797 (1930) c. 572.

[57]41 Stat. 863 (1920) c. 285, sec. 320 as added 1935, c. 687, Title II, sec. 213; 15 U. S. C., c. 12, sec. 791-828c (1958). (Hereinafter referred to as Federal Power Act.)

and service analysis designed to give adequate performance to the consumer at the lowest price consistent with the maintenance of the industry. Hence the companies generating and transmitting electric energy interstate were regulated so that they might receive a limited, but adequate, return. The Commission set up standard accounting procedures so that costs could be determined, and did rate and cost studies to provide basic information to itself and other regulating agencies. It periodically published rate surveys to make information on the prices charged to consumers throughout the country public. Exposure and publicity were expected to bring reduction in rates where high prices could be explained only by consumer exploitation. In this way the FPC hoped to influence rates it could not act on directly.[58]

The Commission was primarily engaged in trying to bring the advantages of cheap electricity to the consumers. It was not interested in broader public policy issues, nor were conflicts in policy common in the work of the Commission. The FPC staff presented factual analysis of costs, returns, and technical problems. Commission decisions were reached by comparing existing conditions with generally accepted standards. Controversy within the Commission and over Commission decisions therefore usually referred to the nature of the findings rather than to the standard against which the case was judged. There was little conflict over the nature or goal of regulation--which was traditional and generally accepted, though the Federal Power Commission was dissatisfied with such procedural matters as the doctrine of replacement cost which was a legacy from Smyth v. Ames.[59]

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[58]The FPC annual reports for various years give a good picture of FPC operation in terms of actions taken, legislation approved, problems noted. Illustrative of this was the Federal Power Commission, Fifteenth Annual Report, 1935 (Washington: U.S. Government Printing Office, 1936), pp. 1-16 which reported on electric energy prices and regulation.

[59]Smyth v. Ames, 169 U.S. 466 (1898). The decision in this case required that companies be allowed to earn a fair return on a fair value of invested capital. Among the elements going into the make up of the "fair value" was reproduction cost of the assets valued. The emphasis on reproduction costs increased over time during the period of

Federal Power Commission Approach to the Regulation of Natural Gas Transportation

Congress, when it passed the Natural Gas Act, apparently acted under the assumption that the federal regulation of natural gas presented essentially the same problem as did the regulation of the electric industry following the Attleboro case.[60] In any event, the Act was modeled on the Federal Power Act regulating the interstate transmission of electricity. The purpose of the Act was interpreted as being to fill the "attractive gap" in regulation created by the absence of state control over interstate gas movement, just as the Federal Power Act established control over the generation and transmission of electric power interstate.

The Federal Power Commission, in its early regulatory efforts under the Natural Gas Act, functioned in terms of the traditional public utility concept. As the Commission itself said in an explanation of its change toward another method of determining an allowance for gas produced by a pipeline company,

> It may not be surprising that, with its background of actual legitimate original cost determinations for licenses under the Federal Water Power Act and of efforts to regulate interstate wholesale electric rates under Part II of the Federal Power Act, the Commission should at the outset of its regulation of rates under the Natural Gas Act have followed a similar approach.[61]

Among the FPC's first actions were programs initiating uniform methods of accounting (specifically mentioned in the statute, however), investigating and collecting cost data, and otherwise acting in a

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inflation which followed World War I. During the decade of the depression, with falling rather than rising prices, original cost less depreciation came to be favored in some jurisdictions. The decision in the Hope case [F. P. C. v. Hope Natural Gas Co., 320 U.S. 591] instituted the rule of the "end result." This decision defined reasonable rates as those "Rates which enable the company to operate successfully, to maintain its financial integrity, to attract capital, and to compensate its investors for the risks assumed." (Ibid., p. 602.)

[60] Public Utilities Commission of Rhode Island v. Attleboro Steam and Electric Co., 273 U.S. 83 (1927). (Hereinafter referred to as Attleboro.)

[61] In the Matter of Panhandle Eastern Pipe Line Company, 13 F. P. C. 53, 69 (1954). (Hereinafter referred to as Panhandle Eastern.)

traditional way to protect the consumer from the monopolistic exercise of power by the natural gas transmission companies.

The regulation of rates and standards of service for the interstate transmission of natural gas and electricity was therefore accomplished through traditional public utility means. This approach was appropriate for interstate transmission because the requirements of efficiency in resource utilization prohibited sufficient units in a single consumption area to maintain a stable competitive structure. There were no efficient gas transportation alternatives to give even interindustry competition.[62] The services performed by the pipelines were repetitive in nature, except in planning and initiation, and required little managerial innovation or imagination. The industry was characterized by a high proportion of fixed costs and there were few alternatives to which implanted facilities could be turned in the face of changed demand or supply conditions. Natural gas was an essential service to consumers, and the distributing utilities had no realistic options to service from the interstate transmission lines. Gas transmission was therefore an industry affected with the public interest. The operations of the interstate transmission lines qua transmission, then, were ideally suited for public utility regulation. Because of this suitability, the cost-of-service and return on rate-base formula pre-empted the field of regulation techniques leaving no room for conflict over method.

In some of its regulatory activities the FPC was not guided by the cost-of-service formula because some of the decisions reaching its jurisdiction called for policy determinations instead. Decisions on certification and certification criteria fell into this category. Some

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[62]There has been some talk of transportation of natural gas in a liquid stage by means of tanker. While this means has been used to a limited extent, thus far it has been proposed only on over-water routes where pipelines are at present prohibitively expensive. Future experience, however, might present the pipelines with a transport competitor which would put an upper limit on transportation charges. Ocean carriage would be especially attractive between the coastal and tidelands Southwestern production areas and the East Coast. It would also provide an effective peaking service.

judgment necessarily was exercised in deciding which applicant was to provide what services in interstate gas transmission. The feasibility and desirability of any project, the nature of the service to be provided, the type of facilities to be installed, and the area to be served were similarly within the Commission's jurisdiction. These areas of authority involved public policy alternatives, the conflicts between which were incapable of resolution by reference to codes or previously established formulas which could be applied in any circumstances.

Early FPC Natural Gas Transmission Regulation

The Federal Power Commission regulation of the interstate transporters of natural gas began with rate investigations two weeks after the passage of the Natural Gas Act. The early cases came at the instigation of state utility commissions seeking rate reductions at the city gate on grounds of unreasonableness. In this same early period the Commission also suspended a rate increase pending an investigation into reasonableness and lawfulness of the proposed change. Certificates of convenience and necessity were considered and import-export petitions submitted to the Commission. Petitions to intervene were filed by the bituminous coal industry which attempted to block expansion of the natural gas industry because it threatened coal sales.[63] The level of activity of the Commission in those early days was reflected by a statement appearing in the Nineteenth Annual Report, 1939: "The number of complaints . . . the number of investigations and proceedings, . . . the number of rate suspensions and show cause orders . . . stand as eloquent testimony to the need for that Federal regulation of interstate natural-gas rates embodied in the Natural Gas Act."[64]

The major emphasis of the FPC activity was to lower gas rates. Indeed, the annual reports of 1938-1940 did not mention consideration

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[63]Federal Power Commission, Eighteenth Annual Report, 1938 (Washington: U.S. Government Printing Office, 1939), pp. 1-8.

[64]Federal Power Commission, Nineteenth Annual Report, 1939 (Washington: U.S. Government Printing Office, 1940), p. 8.

of goals other than low rates. The aim of regulation through the rate-base method was outlined in the Twentieth Annual Report, 1940, in a two page statement. The first paragraph of this statement contained the substance of the then current philosophical basis of Commission regulation; a later paragraph pointed up some of the problems of regulation:

> The Commission believes that sound thought on the subject [of gas regulation] must begin with the premise that the regulation of privately owned public utilities came into being in large measure as a substitute for competition in a field which had come to be considered as adapted to "natural monopoly." In the main its purpose was to assure the lowest possible costs and prices for utility services . . .[65]
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> . . . . . .
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> The story of utility regulation, however, has been in the main a story of increasingly elaborate and protracted procedures devised by representatives of private companies to delay or circumvent the efforts of regulatory bodies to achieve these objectives. The reason for this appears obvious. Having obtained a status substantially free from competition, these companies now seek, by the establishment of elaborate techniques, to regain the arbitrary control of costs and rates which would be theirs under unregulated monopoly.[66]

One of the problems facing the FPC as it established regulation of pipeline transportation of natural gas was the determination of what value to place on gas as it started to the ultimate consumer. The Columbian decision of 1940 resolved the question with reference to gas purchased from independent producers: Such gas was to enter at its purchase price when that price was established through arm's-length bargaining.[67] Treatment of gas produced by the pipeline company itself still had to be established. It is to this problem that the discussion now turns.

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[65]Federal Power Commission, Twentieth Annual Report, 1940 (Washington: U.S. Government Printing Office, 1941), pp. 13-14.

[66]Ibid., pp. 18-20.

[67]In the Matters of Columbian Fuel Corporation, 2 F. P. C. 200 (1940). This case is discussed more fully in Chapter V where the evolution of FPC control over the independent producer is traced. (Hereinafter referred to as Columbian.)

Regulation of Integrated Producer-Transporters of Natural Gas

The federal responsibility in natural gas regulation under the Natural Gas Act was to establish a reasonable and nonexploitative price for natural gas at the city gate. In the Columbian case it was decided that the transmission company could recover as part of its cost of service any payments to independent producers which were arrived at without collusion and at arm's-length. In a case decided soon after Columbian the corollary to this decision was announced. The FPC took jurisdiction over the cost allowance for gas as it entered the transmission line whenever arm's-length negotiations did not exist. The question of the form this regulation was to take remained.

A discussion of the two broad categories of possible regulatory methods for treating integrated production takes up the greatest part of the remainder of this chapter. These categories are the traditional cost approach most frequently associated with the general public-utility regulatory method and regulation based on value in consumption, measured, in this context, by the payments for gas under similar conditions in the presence of workable competition. A brief statement of the Commission findings which led to regulation precedes this discussion, and some concluding remarks serve to summarize some of the developments in social control of integrated production.

The Billings Case: FPC Jurisdiction Over Integrated Producer-Transporters of Natural Gas

The jurisdiction of the FPC over the production of gas by interstate pipeline companies was decided in the case styled Billings decided October 15, 1940.[68] The Billings Company was a wholly owned subsidiary of the Ohio Oil Company engaged in transmitting and distributing natural gas from a point on the Montana state border to Billings, Montana and other points. The FPC ruled that the Billings Company was a natural gas

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[68] In the Matter of Billings Gas Company, Ohio Oil Company, and Mountain Fuel Supply Company, 2 F. P. C. 288 (1940). (Hereinafter referred to as Billings.)

company under the meaning of the statute because it was engaged in the transmission of gas which moved uninterruptedly across state lines. The fact that it was a wholly owned subsidiary of a natural gas company also gave it regulated status. The Commission refused to prescribe steps which Billings or the parent Ohio Oil Company could take to so segregate its affairs as to avoid jurisdiction. The important rule established by this administrative decision was that a natural gas company could not isolate some of its activities from the jurisdiction of the FPC.

> While it is true that certain activities of this company do not involve the transportation of natural gas in interstate commerce or the sale of natural gas for resale in interstate commerce, it is, nevertheless, the fact that this Commission's jurisdiction over a person as a "natural-gas company" attaches to the person or the corporate entity and compliance with the requirements of the Commission's applicable orders, rules, and regulations will be required of one having such status.[69]

Later jurisdiction cases were settled on essentially the same grounds. Firms which could not demonstrate effective separation between themselves and a natural gas company were held constructively a part of that company and jurisdiction was asserted. Whenever either distribution or production and/or gathering activities alone were involved, however, and where in addition there was an arm's-length transaction, firms were relieved of the duties of a natural gas company. The question raised in the original Columbian decision as to the reasonableness of the gas price or the existence of competition was not explicitly raised in subsequent orders determining jurisdiction.[70]

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[69] Ibid., pp. 289-290.

[70] Among the more important cases based on facts similar to Billings and decided by administrative order were: LaGloria Corporation, 7 F. P. C. 349 (1948); The Superior Oil Company 7 F. P. C. 627 (1948); Kansas Nebraska Natural Gas Company, 6 F. P. C. (1947); Hassie Hunt Trust, 6 F. P. C. 835 (1947); Sinclair Prairie Oil Company, 6 F. P. C. 1059 (1947); and the four cases decided together and relating to the same property, American Republics Corporation, 7 F. P. C. 952 (1948); Houston Oil Company of Texas, 7 F. P. C. 953 (1948); Humble Oil and Refining Company, 7 F. P. C. 954 (1948); General Crude Oil Company, 7 F. P. C. 1024 (1948).

Cost-Based Valuation of Integrated Firm Production

One method of valuing gas as it entered the transmission line from production controlled by the natural gas company was on the basis of cost of service. This is the method which is usually associated with regulation of public utilities. It is also the method utilized by the FPC in its supervision over rates charged by the interstate transporters of natural gas in the transportation phase of their operations. Explanation of this method of regulation, and a starting place for its evaluation, can best be accomplished through examination of a case where it was used. The Colorado Interstate case was chosen for this purpose.[71]

Colorado Interstate: cost-based regulation of integrated firm production

The Colorado Interstate case provided an arena for the contention between the alternative approaches to appropriate regulatory policy. Though the question of the valuation of gas as it entered the transmission line played only one part in the case, the method of valuation chosen was considered at length in the arguments and in the decisions rendered. This case was one of the first where integrated production regulation was argued at length. The freshness of the issues and perhaps the consciousness that the case would be precedent-setting led to a high level of argumentation. The issues received more attention than the inherent values involved justified. These factors made Colorado Interstate a notable example of the application of traditional regulation to integrated producers.

The FPC worked solely within the framework of the public-utility concept in reaching its decision on Colorado Interstate. The method of valuing property, the means used to establish an appropriate rate of return, and the division of costs and revenues among the regulated and

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[71] In the Matter of Canadian River Gas Company, Colorado Interstate Gas Company, and Colorado-Wyoming Gas Company, 3 F. P. C. 32 (1942). This case grew out of an investigation instituted by the FPC on March 14, 1939. Colorado Interstate took the case to the Circuit Court of Appeals, Tenth Circuit. Upon appeal the Supreme Court granted certiorari. Colorado Interstate Gas Company v. Federal Power Commission, 324 U.S. 581 (1945). (Hereinafter referred to as Colorado Interstate.)

unregulated portions of the enterprise all testified to the refusal of the FPC to differentiate between producing and transporting portions of the firm's operations.

The Supreme Court was careful not to prescribe the regulatory technique chosen by the FPC in Colorado Interstate as the only one acceptable under the law. It simply held, in the majority opinion, that the FPC was not prevented from using the rate-base method if the end result was fair to the company and consistent with the aims of the Natural Gas Act. Throughout the majority opinion, which was written by Justice Douglas, there were citations of public utility texts, articles by public utility economists, and other references that showed that the Court was thinking of traditional cost-based regulation.[72] Justice Jackson, concurring in a separate opinion, disagreed. He argued that the cost approach did not have the flexibility required for regulatory policy making in the natural gas production industry, though it perhaps was suited to regulation of gas transportation.[73] In the Colorado Interstate opinion he gave his now famous statement castigating the illogic of cost regulation of natural gas production:

> To let rate-base figures . . . govern a rate for natural gas seems to me little better than to draw figures out of a hat. . . . These cases vividly demonstrate the delirious results produced by the rate-base method. These orders in some instances result in three different prices for gas from the same well. The regulated company is a part owner, an unregulated company is a part owner, and the land owner has a royalty share of the production from certain wells. The regulated company buys all of the gas for its interstate business. It is allowed to pay as operating expenses an unregulated contract price for its co-owner's

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[72] Ibid., p. 589. Included, for example, were Walton Hamilton, "Cost as a Standard for Price," 4 Law and Contemporary Problems, p. 593; Schlatter, Advanced Cost Accounting (1937); Neuner, Cost Accounting (1930), p. 601; Bonbright, Valuation of Property (1937); Smith, "The Control of Power Rates in the United States and England," 159 Annals, p. 608; Bonbright and Means, The Holding Company (1932); Barnes, The Economics of Public Utility Regulation, (1942).

[73] Justice Jackson's disagreement with the public-utility approach to gas production regulation was expressed forcefully and clearly not only in Colorado Interstate, but in the Hope decision as well. [320 U.S. 591].

share and a different unregulated contract price for the royalty owner's share, but for its own share it is allowed substantially less than either. Any method of rate-making by which an identical product from a single well, going to the same consumers, has three prices depending on who owns it does not make sense to me.

These cases furnish another example of the capricious results of the rate-base method in this kind of case. . . . The Company which took the high risk of wildcat exploration is thus allowed a return of 6-1/2 per cent of nothing for the three leases and a return of less than $300 a year on the others. Their present market value is shown by testimony to be over $3,000,000.

I cannot fairly say that the Commission exceeded its jurisdiction in obtaining this evidence and making these calculations, even though the evidence related to production and gathering of gas. But I do think it is a fantastic method of fixing a "just and reasonable" price for gas.[74]

Jackson, rejecting value based on cost, preferred to use gas commodity price as a tool with which to so order the natural gas production industry as to maximize welfare. As he said in different parts of his opinion:

Farsighted gas-rate regulation will concern itself with the present and the future, rather than with the past, as the rate-base formula does. . . . It will use price as a tool to bring goods to market--to obtain for the public service the needed amount of gas. Once a price is reached that will do that, there is no legal or economic reason to go higher; and any rate above one that will perform this function is unwarranted. If the supply comes from a region where there is such overproduction that owners are ready to sell for less than a fair return on their investment, there is no reason why the public should pay more. On the other hand, if the supply is not too plentiful and the price is not a sufficient incentive to exploit it and fails to bring forth the quantity needed, the price is unwisely low, even if it does square perfectly with somebody's idea of return on a "rate base." The problem, of course, is to know what price level will be adequate to perform this economic function.[75]

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I should like to reverse this case, not because I think the rate reduction is wrong, but because I think the real inwardness of the gas business as affects the future has been obscured by the Commission's preoccupation with bookkeeping and historical

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[74] 324 U.S. 581, 610-611.

[75] Ibid., p. 612.

matter. Such considerations may be relevant to rate-base theories, but will not be very satisfying to a coming generation that will look back and judge our present regulatory method in the light of an exhausted and largely wasted gas supply.[76]

Economic effects of cost-based regulation of integrated production

The controversy expressed in the arguments over cost-based determination of gas allowances rested to some extent on disagreement over the effect of such regulation. The analysis below is aimed at some of this controversy. Actual producing and gathering operations of integrated companies are similar in nature to the transmission function. Production, gathering, maintenance, and pumping are rather routine, utilize reproducible resources with quoted market prices, and involve little fortuity or opportunity for successful speculation. These same conditions do not hold for exploration, development, and acquisition of gas reserves. The formal techniques which would be expected to produce results for integrated firms comparable to those if competition existed, do not yield the return received by the independent producers operating in fact in a competitive market. Consider the formal model as an indication of actual market behavior. If factors were mobile and variable, and the rate of return chosen for regulatory purposes actually corresponded to the cost of capital plus a margin over costs sufficient to adjust for risk and to compensate individuals for remaining in the same occupation, the competitive price and the regulated price would be identical. In both cases relatively insufficient returns would cause factors to migrate elsewhere, and shifts into the industry would result if excessive profits were available. If some factors were not mobile, however, the compensation of those factors would be demand determined and would vary with shifts in demand at a rate inversely related to the mobility of the factors. Economic rent, either positive or negative, would result. Factor immobility is an important part of the explanation of conditions in the gas field markets under regulation.

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[76] Ibid., p. 615.

The effect of cost-based regulation on the integrated producers is traced below within the framework of changing conditions in the Southwestern field markets.

The Southwestern natural gas industry, until the end of World War II, was characterized by 1) associated gas and flush production from wells discovered during the search for oil, and by 2) a demand for gas which was limited because of few pipeline or other outlets. The price of gas as a commodity was just sufficient to bring the necessary gas to the transmission line or other consuming use except in a few market areas. The independent producer received little or no economic return from his gas production. The integrated companies, however, were more able to achieve a satisfactory return from owned production. The negligible returns from the production operations could be supplemented by profits from the other phases of the business which, in the absence of the production properties, they would not otherwise be allowed to earn. Therefore, in the general case, the allowance for pipeline produced gas yielded a higher return to the integrated producer than the unregulated independent producer was able to obtain from the open market. The integrated firm was effectively isolated from the effects of oversupply of a fixed factor on rate of return. Under the conditions that faced the industry in the Southwest through the 1930's and early 1940's the pipeline companies were encouraged to own and acquire their own gas reserves. These reserves came into the company at a cost consistent with the depressed field price of gas.

The rapid widening and deepening of the market for natural gas after World War II brought an increased demand for natural gas in the field. The excess amount supplied hanging over the market at the prevailing price was soon exhausted, and purchasers entering the market were forced to bid against other potential users and against the holding alternative of sellers expecting a rising price trend. Because of the less than completely elastic total supply of gas, even in the long run, and the much less elastic supply in developed and locationally attractive deposits, the price of field gas rose.

On an analytical plane, competition could be expected to hold the return to the mobile factors in gas production to the general economy

level plus some possible quasi-rent. A rise in price yielding returns higher than this would be absorbed as rent by the holders of noncommitted natural gas reserves, who in fact became the prime beneficiaries of the price increases. The industry practice of requiring long term contracts, and the FPC requirement of twenty years reserve commitment by natural gas companies, raised the price of uncommitted reserves even further. Integrated producers and independent producers committed to long-term, fixed-price contracts were unable to take advantage of these higher prices.

The result to be expected from the limitation of natural gas company return on production investment, a shift away from ownership by the pipeline companies, occurred. The natural gas companies found that their gas reserves were worth considerably more on the open market than the capitalized value of the return allowed. While the FPC made an attempt to put some restrictions on the sale of dedicated reserves by the gas companies, producing properties were sold or spun off to take advantage of the greater pricing flexibility of nonregulated independent status.[77] More importantly, new development was left to the independent producer. Greater additions to independent reserves than to captive reserves thus occurred, leading to a relative shift to independent production.[78] The shift to independent production and the other results which followed the use of cost-based regulation in the postwar field market had effects which were considered unfortunate in their impact on the natural gas industry. With this analytical treatment of the effect

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[77]See the following decisions for evidence of attempts of the FPC to force the pipeline companies to retain their owned reserves: Federal Power Commission v. Panhandle Eastern Pipe Line Company, 337 U.S. 498 (1949); Northern Natural Gas Company, 11 F. P. C. 400 (1952); Northern Natural Gas Company, 11 F. P. C. 174 (1952); Northern Natural Gas Company, 12 F. P. C. 66 (1953).

[78]Panhandle Eastern, 13 F. P. C. 53, 75. In the Panhandle Eastern case decided in 1954 in favor of fair field pricing the Commission cites the decline in pipeline produced gas in the following terms:

> "When we look to the over-all situation, we cannot but be struck by the fact that no new major pipeline which has been certificated since the Commission's pricing practice was first

of cost-based regulation on integrated producers as a background some of the value effects of this regulation are considered below.

Implications of cost-based regulation of integrated producers

Under cost-based regulation of integrated producers the allowance for gas which entered the pipelines depended upon its ownership and historical cost. As a result, the price of gas was not directly related to its value as a commodity. This policy discriminated among producers on the basis of contract date, circumstance, and relation to other phases of the natural gas industry. It also discriminated among the ultimate consumers to whom gas came at different prices. The price differentials resulting from alternative methods of calculating a commodity allowance to the integrated producer were small, perhaps two to four cents, compared to a $1.00 per Mcf delivered price to domestic consumers. The impact of this small differential was minor on domestic consumers but of some importance in commercial and industrial uses. There natural gas was consumed primarily on the basis of price compared to other fuels and the cost of the commodity itself made up a much larger proportion of delivered cost.[79]

In addition to the discrimination involved in a multi-price system, prices based on factors other than commodity value in alternative pursuits gave no consistent direction to the allocation of gas over time

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established--including some of the largest systems serving enormous new markets--produces any significant portion in its total supply. That the ratio of pipeline-produced gas to total gas transported and sold in interstate commerce has declined markedly is clearly apparent from the facts of record. This trend is the important thing; the precise movement is a relatively unimportant detail. . . . And we are unable to adopt the position taken in the staff brief that there is no validity in the claim that the rate regulatory policies of this Commission have been a factor contributing to this undesirable result."

[79]See Table H in the Appendix for a comparison of field price to delivered price in various years for different uses. The evaluation of cost-based regulation of gas prices in the field is discussed at length in Chapter VII. The discussion at that point concentrates on independently produced gas but the conclusions are similar.

or among different uses. For example, if the price of gas varied between consumption areas solely because of historical cost differentials, then decisions as to amount consumed in some specified end use would vary for economically irrelevant reasons. Or again, while at a price determined on historical cost it might be economical to consume gas, the price required to make present consumption preferable to future consumption might be prohibitively high or extremely low, depending on future events.

One implication of cost-based allowances for transporter produced gas was disputed both in terms of its effect and its desirability. The contention was sometimes offered that FPC regulation of integrated producers lowered the basic field price. Integrated producers further contended that this result was contrary to the national best interest. Higher field prices were said to be necessary in order to promote conservation, to generate exploration, to induce producers to cease wasting gas, and to shift consumption away from low value uses. The Commissioners rejected this assertion in the reports on the Natural Gas Investigation though they admitted that some indirect effects might exist in this direction.[80] An alternative to the cost approach, commodity valuation, was also considered in the Natural Gas Investigation. The present study now turns to this approach to integrated producer regulation.

Commodity Valuation of Integrated Firm Production

The FPC tradition of determining the amount to be allowed transmission companies for their own gas on the basis of historical cost was overturned in the Panhandle Eastern decision rendered April 15, 1954.[81]

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[80]Federal Power Commission, Natural Gas Investigation, Docket G-580 (Washington: U.S. Government Printing Office, 1948), Smith-Wimberly Report, pp. 178, 189, 250, 260. This report was issued in two volumes, one authored by Commissioners Nelson Lee Smith and Harrington Wimberly and the other by Commissioners Leland Olds and Claude L. Draper. Reference to each volume will be made by the names of the issuing Commissioners, as in above reference and Olds-Draper Report.

[81]13 F. P. C. 53.

Even though this shift in allowance base was not allowed to stand legally, it had important repercussions on the later Commission regulation of independent producers. Commission experience with commodity valuation of gas is discussed first in terms of the facts in the Panhandle Eastern case itself, then general arguments on both sides of the controversy are considered, and finally, the legal disposal of the issue on appeal is reported below.

Panhandle Eastern facts

The FPC decision instituting commodity oriented regulation was preceded by a Commission order issued February 9, 1953, Commissioner Buchanan dissenting, requiring the presiding examiner in the Panhandle Eastern case to take evidence as to "weighted average field prices" and "fair field" prices.[82] This evidence had been refused by the hearing examiner on grounds consistent with past FPC policy. The intermediate decision process was eliminated in the Panhandle Eastern case. The hearings before the examiner were concluded May 15, 1953, and oral argument was completed that November.

The Commission majority based its final decision on certain facts which in broad measure were accepted by Panhandle Eastern, the FPC Staff, and dissenting Commissioner Draper. Panhandle Eastern produced approximately 23 per cent of its gas supply, buying the rest either from independent producers or from its otherwise regulated subsidiary, Trunkline Natural Gas Company. The cost method of establishing an allowance for the gas produced by Panhandle Eastern required revenues averaging .85 cents per Mcf to yield the cost of service and an appropriate return on rate-base for the test year. When tax benefits due to the production phase of the company's operations were added to the other revenues, Panhandle Eastern was left with a .12 cents per Mcf cost-of-service. Revenue from joint products reduced net cost-of-service further to an average of a negative 1.24 cents per Mcf. The Commission majority pointed out that rising depreciation and depletion reserves,

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[82] Order on Appeal to the Commission from Certain Rulings of Presiding Examiner with Respect to the Admissibility of Evidence, 12 F. P. C. 840 (1953).

as well as rising prices for joint products, would bring this return even lower (more negative) over time.[83] Panhandle Eastern paid an average of from 7 cents per Mcf in Texas to 11 cents per Mcf in Oklahoma for gas purchased from independent producers. If the company were allowed an average field price for gas it produced, revenues on jurisdictional sales would rise approximately $3,571,448 or 1.3 cents for every Mcf of jurisdictional gas sold.[84]

Majority argument for commodity-based regulation

The FPC majority argued that an allowance based on the average price received by independent producers, the "fair field" price, was preferable economically, was acceptable to the courts, and was not precluded by the precedent of cost-based regulation. The economic arguments against cost-based allowances were those mentioned in a previous section, namely that the multi-price system was capriciously inequitable, that allocation of gas over time was indefensibly weighted toward current rather than future use, and that exploration and development of needed additional reserves was discouraged.[85]

The Commission also argued that continuation of the cost basis would lead to progressive diminution in the role of transmission-owned production. Several effects judged harmful were expected from this development. First of all, the weakened bargaining position of the transmission companies was expected to lead to higher prices for gas in the fields. Second, it was anticipated that the lack of production by the transmission companies would make it more difficult for these firms to balance out their seasonal gas requirements. The take or pay provisions in contracts with independent producers (discussed at greater length in Chapter V below) lessened the ability of the firms to make satisfactory adjustment to the fluctuating demand for gas. Finally, the Commission argued that the continued presence of the transmission companies in the production phase of the industry helped to assure the long-run availability of gas reserves.[86]

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[83] 13 F. P. C. 53, 61-62.
[84] Ibid., pp. 62-63.
[85] Ibid., pp. 71-74.
[86] Ibid., pp. 74-75.

The Commission argued that the courts had approved of cost-based regulation but had not established it as the only acceptable method. The general judicial tradition, and the wording of the Natural Gas Act itself, argued against the substitution of judicial for expert Commission opinion on substantive matters.[87] Hence, so long as Commission rulings were not discriminatory, did not result in unconstitutional confiscation of private property, and were consistent with the enabling legislation, they were safe from judicial reversal. In a more positive direction, the Commission noted that both minority and majority decisions of the Supreme Court had mentioned that cost-based regulation of gas production was perhaps less suitable than other alternatives. The Commission decided that divergence from the cost approach was acceptable if reason for the divergence existed.[88]

The traditions of the FPC itself were of no moment in making changes in regulatory policy, the Commission held, because custom and tradition did not bind the Commission as they bound the courts through the doctrines of stare decisis and res adjudicata. The Commission was bound, it said, only to follow the law and to render decisions in the public interest. Changing conditions and the experience gained through the administration of the law were ample reasons to change a procedural method if public gains could be foreseen.[89] "The question here presented is what method of pricing pipeline-produced gas will, under present day realities and in the light of the facts of record in this case, best serve the ultimate public interest."[90] For these reasons, then, the Commission set the rate schedule for the Panhandle Eastern Pipe Line Company to reflect evaluation of the gas produced by itself on the basis of sales at arm's-length in the fields from which the gas was drawn.

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[87]The Natural Gas Act explicitly stated that no evidence was to be considered except by the Commission. 52 Stat. 831 (1938); 15 U. S. C. 717 r.

[88]13 F. P. C. 53, 64-69.

[89]Ibid., pp. 64-65.

[90]Ibid., p. 69.

Dissenting arguments opposing commodity-based regulation

There were two dissents from the Panhandle Eastern decision, those by Commissioners Doty and Draper. The Doty dissent referred only to the method of treating tax concessions granted by Congress and therefore was not related to the gas allowance issue.[91] Draper's dissent, however, centered on the change in regulatory method. He stated that there was not enough latitude in the Natural Gas Act to permit the rejection of the traditional method of rate making and the substitution of fair field pricing. He further held that cost-based regulation was in the general public interest. His stated reasons for these conclusions are summarized in the following eight points:[92]

1. Cost-based regulation of pipeline-produced gas had been scrutinized in previous studies and had always been approved as the method of choice to foster public welfare.
2. Legislation seeking to put the fair field method into the law had failed of passage.
3. The FPC was not empowered to take into account various economic or local conditions in making its determinations. [Draper relied on the Hope case (320 U.S. 591, 608) and on Corporation Commission of Kansas v. F. P. C.; Northern Natural Gas Company v. F. P. C., 206 F. 2d 690 (Certiorari denied January 4, 1954.) Reference was also made to the Colorado Interstate decision (324 U.S. 581), and to Justice Jackson's dissent.]
4. The fair field method did not replace the cost-based method with the maximizing alternative envisaged by Justice Jackson in his dissents, but instead substituted another method which could give rise to similar "delirious results." "No test was made to ascertain whether the annual additional revenues of $3,571,448, which the majority gave Panhandle for its own produced gas, are too great or too small to achieve the social objectives thought desirable by Mr. Justice Jackson."[93]
5. The fair field method did not avoid different prices for production from similar or identical locations, and more seriously, did not provide an objective test for determining

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[91] Ibid., pp. 117-122.

[92] Ibid., pp. 123-140. (Summary in paraphrase by the present writer. Direct quotes are noted with separate reference.)

[93] Ibid., p. 130.

the weighted field average to be used in ascertaining appropriate allowances.

6. The determination that Panhandle Eastern would receive a negative 1.25 cents per Mcf was fallacious. The gas produced would make a net contribution to Panhandle Eastern's return under cost-based regulation.

7. The rates established under the fair field method were not the "lowest reasonable rates" and therefore did not fulfill the legislative mandate of the Natural Gas Act.

8. The effect of the regulation on the individual consumer, or the minimal nature of that effect, was not a proper matter of concern to the Commission. Legal rates should be determined as the lowest reasonable rates without consideration of their ultimate impact or lack thereof.

Judicial review of fair field pricing

The City of Detroit and the County of Wayne, Michigan, representing consumers of Panhandle Eastern gas, challenged the FPC decision to allow average field prices to determine the allowance received by Panhandle Eastern for its own production. An appeal, taken to the Circuit Court of Appeals of the District of Columbia, was decided on December 15, 1955, in favor of the petitioners and against the FPC and Panhandle Eastern as intervenor.[94]

The decision of the Court of Appeals held in part:

> . . . that evidence was insufficient to justify the allowance by the Federal Power Commission of the fair-field value of the gas produced by Pipeline Company itself as an operating expense in determining just and reasonable rates for natural gas, and that Commission's failure to credit Company's revenues from gasoline extraction operations was improper.
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> Order set aside and case is remanded for further proceedings.[95]

The reasoning of the Court rested on the key words "evidence insufficient to justify . . . fair-field value." The Court did not object to the

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[94] City of Detroit v. Federal Power Commission; County of Wayne, Michigan v. Federal Power Commission, 230 F. 2d 810 (C.A.D.C. 1955). (Hereinafter referred to as City of Detroit.)

[95] Ibid., pp. 810.

abandonment of the traditional rate-base method. As it said, earlier interpretations of the Act did not require "that use of the field price [method] is necessarily prohibited and that the rate-base method is mandatory for all properties and all circumstances. The holding in the case is inconsistent with such a meaning . . . it is the result reached, not the method employed, which is controlling."[96] The use of prevailing field price as an element in the ultimate composition of rates was perfectly permissible, the Court held, so long as the result reached was not a rate higher than that which was just and reasonable.[97]

The Commission was reminded that the fundamental purpose of the Natural Gas Act was to prevent the exploitation of consumers, and that this must be the basis of Commission policy and action. In pursuing this end, the FPC was not required to hold rates at the lowest possible level--to the "brink of confiscation." This rate was a constitutional limitation, not a statutory command.[98] The need for exploration and development of gas reserves in order to assure future supplies was an acceptable element in rate making so long as it was directly related to the fundamental purpose of the Act. The Court concluded that the Commission must use the rate-base method as a point of departure so that some comparative basis for decision was available.[99] Denying the applicability of the concept of opportunity cost to rate making, the Court held that prices paid to other producers could not automatically be placed into the rate equation as a determinative element.

The whole thinking of the Court, then, revolved not around the use or non-use of a cost-based method, but instead on the validity of the fair field prices as the determinants of allowances for gas produced by interstate pipeline transporters. As the Court said in summarizing this position:

> If the Commission contemplates increasing rates for the purpose of encouraging exploration and development, or the ownership by pipeline companies of their own producing facilities, it must see to it that the increase in fact is needed, and is no more than

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[96] Ibid., p. 814.

[97] Ibid., p. 810.

[98] Ibid., p. 815.

[99] Ibid., p. 810.

> is needed, for the purpose. . . . The amount allowed to Panhandle for the encouragement referred to is not shown to meet this test by any evidence and findings.
>
> The amount here allowed is not brought into relationship by the evidence and findings with purposes for which it is granted except that it affords a larger revenue to Panhandle than otherwise it would have. This is not an adequate basis for bringing the resulting rate within the "just and reasonable" standards of the Act. The mere fact that the field price method is used does not vindicate the rate. Its use can be justified only in terms of demonstrated public interest. In this case an allowance for the desired purposes, assuming they are valid, could be included without resort to field price.[100]

The Federal Power Commission appealed the City of Detroit decision to the United States Supreme Court. It denied certiorari.[101] The case was then remanded to the FPC for further consideration in the light of the Circuit Court decision. The FPC was forced to return to the traditional cost-based regulation of the integrated producers of natural gas. The cost-based method remained the basis for determining the allowance for gas produced through the end of 1962. No other concerted attempts were made to use the fair field price, partly because the issue of independent producer regulation arose to take the central position in the controversy over the appropriate role of the federal government in gas industry operations.

Social Control in the Natural Gas Industry

The City of Detroit decision stabilized all regulation of the natural gas industry other than that dealing with the sales for resale in interstate commerce by independent producers. A summary of industry regulation as it existed when independent producer control became the major item of controversy is now possible. The physical production of natural gas was under the supervision of the producing states. The distribution of natural gas to ultimate consumers was treated as a public

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[100] Ibid., p. 817.

[101] Certorari denied, 351 U.S. 829 (1956). Petition for rehearing denied November 19, 1956.

utility operation in most jurisdictions, with local authorities charged with the duty of protecting consumers from exploitation. The constitutional barrier which prevented the states and localities from enforcing their estimates of fair value on the industry beyond the state line brought federal government regulation of interstate transmission. For the same reason, the production of gas by the transmission companies was subjected to similar federal price control. The valuation of gas produced by the transmission companies was assimilated into the same public-utility framework which was used to regulate the rest of the industry.

Federal regulation of the sales for resale of natural gas produced by independent producers had been suggested and was developing before the cost-based regulation of integrated production was re-established by the City of Detroit case. Understanding of the development of this regulation requires knowledge of the market for natural gas in the field. Chapter IV below is presented to provide that information as background to the analysis of the development of FPC independent producer regulation in Chapter V.

CHAPTER IV

CHARACTERISTICS OF THE FIELD MARKET FOR NATURAL GAS

The field market for natural gas consists of the exchanges of gas between independent producers and direct or indirect consumers of natural gas. The exchange takes place at the point where the production, gathering, and processing operations by the producer or his representatives are terminated. It was this market over which the FPC assumed control after the Supreme Court decision in the Phillips case expanded the recognized scope of authority under the Natural Gas Act. This study concentrates on the market for gas produced in the Southwest.[1] The other markets, while of local importance, do not provide a sizable share of the gas moving into interstate commerce. Moreover, similarities between conditions in all field markets allow the study to be limited to the Southwestern region without significant sacrifice of general relevance. Characteristics of this market which influenced the course of regulation and the suitability of various methods of exerting social control over this phase of the industry are examined below.

The matters deemed essential for an understanding of the field market in the light of regulatory problems were summarized in three parts for presentation here. The first of these is the institutional organization of the field market. The second centers around the relationships between the independent natural gas producers and the interstate pipeline purchasers of natural gas. The field sales contract

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[1]Southwest in this context refers to the five major gas producing states, Kansas, Louisiana, Oklahoma, New Mexico, and Texas. In 1960 they produced 6,754.9 billion cubic feet of the 7,544.2 billion cubic feet transported interstate. Table B in the Appendix contains data on the role of the five Southwestern states in the natural gas industry of the United States.

and its elements provide a convenient outline for examining these relationships. Finally, the market structure in the field markets was studied for indications of expected behavior relevant to regulation. Several competent studies of competition in the field markets have been made; these studies were the source of the findings which are reported in the last section of this chapter.

Field Market Organization

Two essential physical functions in the natural gas industry are the production and gathering of gas and its transportation to interstate consumers. The field market corollaries to these functions are selling, by the producer, and buying, by the transporter. Some firms are engaged solely in selling natural gas which they have produced. These are called independent producers. Other firms limit themselves to buying natural gas from others for interstate transportation. "Integrated" gas firms both produce gas and market it interstate. Whatever the institutional arrangement, the function performed is the important analytical element.

Sellers of Natural Gas in the Field

The sellers of natural gas in the field markets are either the producers themselves or others in effect acting as agents of producers.[2] The producers of natural gas are those owning the wells and the producing facilities through which natural gas is brought to the surface. These producers secure gas reserves, either by purchase or by exploration, develop production, and operate producing and gathering facilities. Natural gas produced is sometimes secured as a joint product with oil, in which case it is known as associated or casinghead gas. Dry gas is that produced with no associated liquids. From some reservoirs gas is produced along with condensate (heavy hydrocarbons which condense into

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[2]Some natural gas plants sell residual gas after processing it for liquid hydrocarbons. Whether the plant takes ownership of the gas and therefore sells to its own account, or merely sells as an agent of the producer, is of no functional significance in field market analysis.

liquids when pressure is released). Whatever the nature of the gas supply, the producers determine the conditions under which it is released for interstate shipment.

The similarity in function between the integrated and the independent producers does not carry over to similarities in the commercial transfer of gas from the producer's control. The integrated firm transfers gas "ownership" from one division of the corporate entity to another, except for some possible extra-firm sales to local consumers or transporting companies. The independent producer gives up all future control over the gas in exchange for agreed upon payments. In the one case there is, conceptually at least, a mere intra-company transfer price agreed upon for control purposes. The total economic position of the company is not changed by the terms of the transfer. For bargains between the independent producer and the purchaser of gas, however, the terms of the transfer determine intercompany gains or losses. For this reason there is the presumption of an arm's-length bargain between a truly independent producer and a purchaser, while no such presumption can hold for transfers within an integrated firm.

Purchasers of Natural Gas in the Field

The gas purchased in the field is destined for both interstate and intrastate use. The major purchasers of gas for interstate use are the gas transmission pipeline companies. These companies obtain some of their gas supplies from their own production, but even the integrated companies make some purchases from independent producers. Consuming market purchasers, either distributors or those who will use the gas for industrial purposes and power generation, occasionally buy gas in the field market and hire the transmission companies to transport it on a common carrier basis. Under agreements of this sort the transmission companies do not enter into the contracts as the owners of the gas they transport.

The intrastate uses of natural gas are similar to the interstate uses, except that part of the gas is used as a fuel in field production operations. Gas distribution companies purchase gas within the state

for distribution to domestic, commercial, and industrial consumers. Industrial consumers of natural gas purchase gas directly or indirectly for use as a raw material. Gas is used directly in the manufacture of carbon black and as a hydrocarbon source for various chemical processes. Natural gas used in the field is sometimes reinjected into producing formations to maintain reservoir pressure; such gas injection facilitates oil recovery. It is also recycled to bring up the heavy hydrocarbons which could not otherwise be recovered.[3]

Field Market Organization and Federal Regulation

Federal regulation of the natural gas field markets under the Natural Gas Act as interpreted in the Phillips decision extends only to interstate sales for resale of natural gas in interstate commerce. Direct federal jurisdiction in the field market is exerted over sales of gas by an independent producer to a purchaser who buys for resale. The transfers of gas within a firm, as between the production and transmission divisions of an integrated interstate company, are not jurisdictional per se, though they fall under federal regulation if the gas is later sold for resale.[4] From the point of view of this study, the important field market is that in which transfers of gas are made from independent producers to interstate purchasers for resale. The transfer conditions themselves are important to the allocation of natural gas and to the distribution of income. These conditions are examined below.

The Gas Sales Contract in the Field Market

Contracts between producers and purchasers of natural gas in the field deal with many variables, of which price is only one. Some of

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[3] Uses of natural gas on a national basis for various years since 1929 are noted in Appendix Table E.

[4] A thorough explanation of the development and scope of federal authority over the sales for resale of natural gas in the field is postponed to Chapter V below. Provisions of the Natural Gas Act itself were summarized in Chapter III.

these variables have to do with the suitability of the gas for its prospective use and some with the costs of preparing it for interstate transmission. Among these might be listed such items as gas purity, heat value, pressure, size of reservoir dedicated, and number of points of delivery. Adjustments required in contracts to make proper allowance for differences in these conditions are rather determinable and straightforward. The price at which gas is to be transferred, however, and at least three other matters are not technical and depend instead on the results of bargaining between the gas producers and the interstate pipeline purchasers. These elements of gas sales contracts either directly or indirectly affect the allocation of gas and the distribution of income and have an effect on regulation policy.

In the analysis of the field market for natural gas which follows, three elements in gas sales contracts are examined. The first of these is the life of the sales contract; the second is the indefinite pricing provisions found in some contracts; and the third is the take or pay provision. The general level of price is not considered except as it relates to other field market conditions. The interest in this material rests on three factors: first, the historical changes in the producer-purchaser balance of power in the market are illustrated by the changing contract provisions as much as by changes in the gas price level. Second, regulation and market institutions must be reconciled, and the institutions of the gas field market are embodied in contract provisions. Finally, the clauses considered have important public policy implications in themselves.

Length of Contract Life

One significant difference between the sale of natural gas and the sale of many other commodities, including any associated oil and natural gas liquids, is that the sale of natural gas typically is made through long term contracts. A survey of contracts in the Southwestern field markets for the years 1945-1953 by Edward J. Neuner showed that approximately 38 per cent of the contracts were for twenty years or longer. Two per cent of the contracts were of indefinite length and

presumably limited only by the life of the reservoir. Fifty-six per cent of the contracts were for fifteen or more years, while 78 per cent were for over ten years. Only 19 per cent of the contracts covered less than ten years, while five per cent of the contracts expired before the passage of five years.[5]

Reasons for long term contracts

Long term contracts in the natural gas industry arose from the desire to provide a secure supply of gas over a long enough period to amortize fixed investment. Protection was desired for two categories of investors, the interstate transmission lines and the ultimate consumers, especially domestic and commercial users. The typical elements of investor decisions which led to the institution of long term contracts are analyzed below.

An interstate pipeline cannot be moved in search of gas supplies once it is in place, though extensions can be laid to new reservoirs. Similarly, the pipeline has almost no alternative uses. The initial commitment of the pipeline to a given source of supply would require, then, assurances of long term adequacy of available reserves as a prerequisite for financial feasibility and for easy access to capital markets. Mere physical availability of gas supplies in the field would not be sufficient in the absence of a firm dedication of those supplies to the particular pipeline. If gas supplies were owned by the pipeline, availability would be of no concern. If independent producers were relied upon, however, long term, firm, contracts would be essential.

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[5]Data calculated from Edward J. Neuner, The Natural Gas Industry: Monopoly and Competition in Field Markets (Norman: University of Oklahoma Press, 1960), pp. 104-07, including Table 18. Neuner presented data for 723 contracts negotiated between 1945 and 1953 in the Southwestern field markets. He pointed out that the indefinite nature of the provisions in some contracts with price renegotiation clauses could lead to different interpretations of the length of some contracts. For our purposes, however, such adjustments are unnecessary because we deal with the length of the dedication.

Once natural gas enters a consuming area the potential consumer faces the decision as to whether to begin natural gas service or not.[6] This decision is usually faced upon the occasion of a replacement of an appliance so that the conversion to service is gradual and amounts to a marginal shift in use rather than a sudden switch. Ordinarily, the consumer invests in equipment which has a high capital cost relative to the cost of the gas service. Therefore the ultimate consumer is a "captive" of the natural gas service in the sense that with the purchase of gas appliances he shifts his demand for natural gas upward. While the consumer can shift back to other energy sources, such a shift will ordinarily involve a capital loss unless it takes place gradually as replacement of gas appliances becomes otherwise justified.[7] Long run availability of gas supplies is required to guard against such capital losses. Mindful of the fixed nature of the consumer investment in equipment to utilize natural gas, the FPC has required pipeline companies

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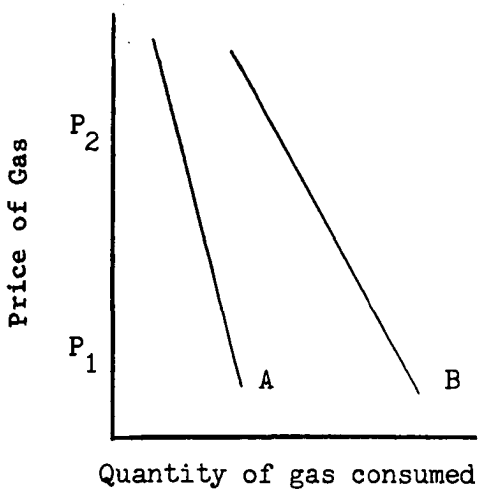
[6] If the consumer was formerly served by manufactured gas the decision is out of his hands. He must convert his appliances because his earlier service will no longer be available to him. Of course, he also has the option of discontinuing gas service. Consideration of this matter from the distribution industry viewpoint is found above in Chapter III and is treated on the consumer level here.

[7] A distinction frequently ignored in this connection is the difference between a shift in a consumer's demand for natural gas and a response to a change in price given a certain demand structure. Demand curve A in the illustrative graph below shows a given (small) demand for gas for a limited purpose, say cooking. Demand curve B shows the short run demand for gas by the same consumer after an investment in additional gas using appliances. If price rises from P_1 to P_2 after the investment the householder can only move up his demand curve B. Given price P_2 at the time appliance replacement decisions were made, the consumer might well have decided not to use gas as an energy source. After the investment he no longer has this choice except at the expense of a capital loss. Consumption of gas does, however, respond to price changes though the elasticity of demand can be expected to be small.



to control adequate reserves to assure long run gas service in the consuming markets as a precondition for certification. Contracts not contributing to the twenty year deliverability of gas are not considered as part of the available supply required before certification.

Producer objections to long term contracts

Long term contracts, though to the advantage of the transporters and the consuming public, were not similarly desirable from the producer point of view.[8] The producers could be expected to resist dedicating reserves for twenty years at current prices for two reasons. First, the producer costs of uncertainty from short term contracts were low relative to potential gains, even assuming no change in the average price of gas. Second, higher gas prices were in fact to be expected during the 1946-1960 period, given the underlying market factors.

General preference for short term contracts

The producers recognized that the pipeline companies were subject to significant exit costs once lines were connected and facilities in place. These exit costs were a source of bargaining power to the producers because the pipeline could be required to pay the cost to it of receiving gas from its best alternative upon threat of disconnection. Given the capital outlays required, the exploitative gain was potentially large even though the spot price in the alternative field was lower than the price in the original field. The producer could feel relatively sure, then, of selling gas at or above the spot price once the pipeline was connected. Short term contracts increased the opportunity for exploiting the transporter exit costs without at the same time appreciably increasing producer uncertainty. Offsetting the producer's desire for short term contracts was the cost of negotiating added contracts and the possibility of being left without a market if

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[8]The analysis which follows is based on the theoretical reactions of the profit maximizing independent producer. No claim is made that any given individual producer did organize his decisions in this way.

short term contracts were insisted upon. This uncertainty as to pipeline connection was reduced in some states by the ratable taking and prorationing statutes.

The producer commitment decision was made in the face of expected price increases which reinforced the producer desire for short term contracts. The depressed condition of the economy during the 1930 decade delayed expansion of natural gas pipelines and of natural gas consumption, but even during the depth of the depression there were large increases both in natural gas production and in transportation interstate. Between 1933 and 1938, for example, interstate transmission of natural gas almost doubled, going from 347 billion to 637 billion cubic feet. Marketed production of natural gas rose from 1,556 billion to 2,296 billion cubic feet during the same period.[9] World War II slowed the growth in interstate transmission of natural gas, but the growth accelerated when resources were released for pipeline construction following the war. The expected and experienced growth in the market for natural gas raised expectations that the value of the gas in the field would rise when the excess productive capacity was gradually taken up by increased gas sales outlets. The producers, given this picture of the future, preferred not to commit their reserves to long term contracts at fixed prices. So long as their bargaining power was restricted by the excess capacity hanging over the market, however, there was little that the producers could do to alter the contract conditions.

In addition to the expansion of both the interstate and intrastate markets for natural gas, the relative shift from intrastate to interstate consumption led to an even more optimistic sales outlook. The growth in the interstate market allayed fears of intrastate market saturation. In 1933 approximately 22 per cent of marketed gas flowed into interstate channels. In 1938 this figure had risen to approximately 28 per cent, where it stayed until the postwar pipeline expansions started making themselves felt in 1947. In the three years from 1947 to 1950 the proportion of marketed gas going into interstate

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[9] See Table D in the Appendix for source and more complete data.

commerce rose ten points from approximately 31 per cent to 41 per cent. Fifty per cent of marketed gas went interstate in 1953. After 1954 the change from intrastate to interstate use slackened off, and in 1960 approximately 58 per cent of the marketed natural gas flowed across state lines.[10]

The strengthened position of the producer of natural gas was reflected in the trend of gas prices in the postwar period. An examination of that price trend puts the producer's position into perspective and points up the costs to him of fixed field prices. Two indicators of field gas prices are available. The first of these is the average field price of natural gas delivered each year. The second is a measure of new contract prices. Average prices are considered from 1938 forward, but estimates of average new contract prices are readily available only from 1945 through 1953.[11]

The average price data used were drawn from the estimates prepared by the Bureau of Mines and published in the Minerals Yearbook each year.[12] The new contract data were secured from Neuner's study of the Southwestern field markets for gas flowing interstate. The two sets of data are not strictly comparable. The average field prices include all United States sales, some of which are intrastate.[13] Of course, these sales were made under contracts of various maturities and with various initiation dates. The preponderance of old contracts at any one time dampens changes in the series. Neuner dealt only with Southwestern sales to interstate pipelines. New contract data are more responsive

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[10]Calculated from Minerals Yearbook, various years. Data for some years are found in Appendix Table B.

[11]These are the dates covered by Neuner in his study. Other estimates of new contract prices would not be consistent with these data so no attempt was made to fill out the series with the scattered other references available.

[12]Some of these data are found in Table H of the Appendix.

[13]These two differences in coverage compared to Neuner's sample would most likely exhibit counterbalancing bias. Non-Southwestern field prices are probably higher but intrastate use brings lower prices (because of field and carbon black consumption).

to short run fluctuations and the indicating series is not influenced by past prices. The new contract data presented are a composite of the estimated prices of all contracts entered into during a given year with adjustments for non-price contract elements. The resulting series was, in Neuner's terms, "Representative Natural Gas Field Prices, Large-Volume Interstate Pipe-line Market, Various Gas Supply Areas, 1945-1953."[14] Changes in prices from year to year can be expected to reflect market movements, but untoward reliance should not be given to the absolute levels of prices.

Figure 2 was prepared to present the information on price trends in the most meaningful way consistent with a description of changing conditions in the field market. The average field prices are shown by the solid line segments linking the values for various years. A schematic scatter diagram illustrates new contract prices in various supply areas, with one dot for each area in which contracts were negotiated, and two dots if there was a significant change in price during the last half of the year. A typical "representative" price determined by simple averaging of the various new contract price estimates is shown with the broken line.[15]

The price of gas in the field markets was quite stable from 1938 until 1945-1946 at which time the average price started moving up. The national average price, raised by the relatively high prices in the eastern producing regions, was actually above the new contract price in the Southwestern field markets before 1946.[16] After 1946 the new contract prices rose rather steadily until 1951 when average prices jumped

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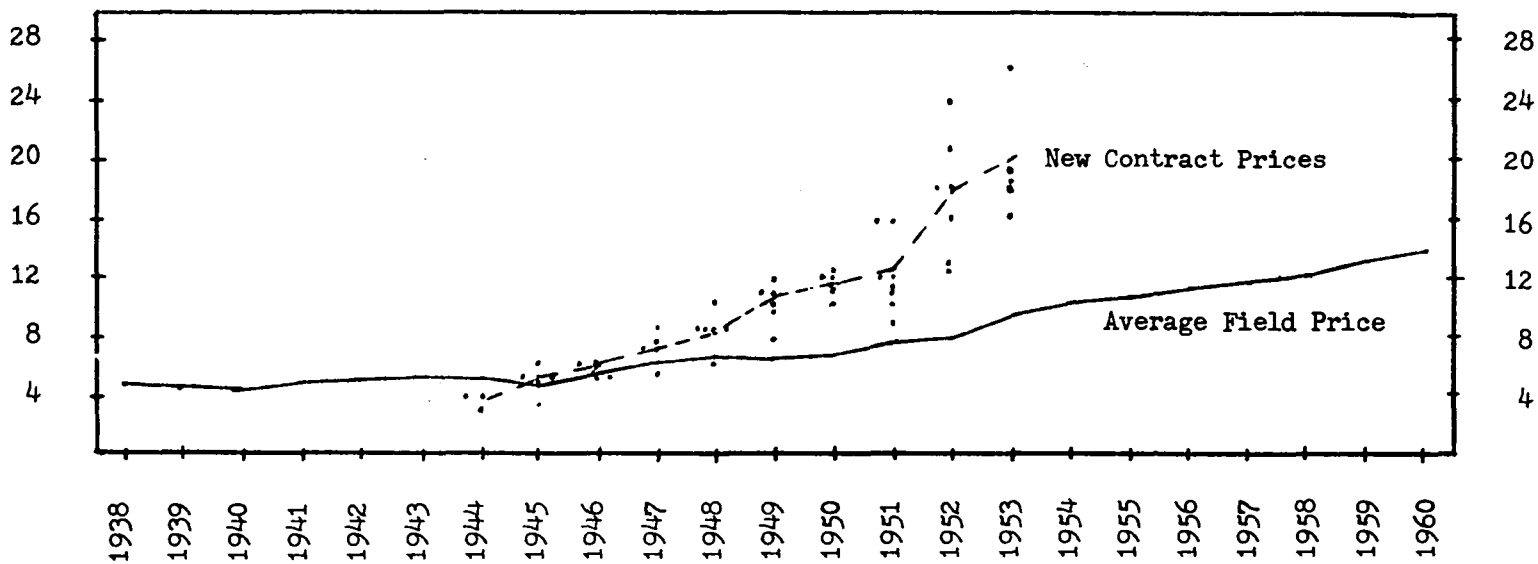
[14] Neuner, Table 16, p. 63.

[15] No consideration was given to differing quantities of gas dedicated or to other contract provisions not already included in Neuner's adjustments. All plots were made to the nearest one half cent.

[16] What Neuner characterizes as the "prior to 1945" new contract price in the Southwestern markets, when averaged as in the data for 1945-1953, works out to a typical price of 3.7¢ Mcf., well below the average national price of approximately 5¢ Mcf. Neuner, Table 16, p. 63.

Figure 2

AVERAGE NATURAL GAS FIELD PRICES, 1938-1960;[a] "REPRESENTATIVE NATURAL GAS FIELD PRICES, LARGE-VOLUME INTERSTATE PIPE-LINE MARKET, VARIOUS GAS SUPPLY AREAS, 1945-53";[b] AVERAGE OF "REPRESENTATIVE FIELD PRICES," 1945-1953[c]



[a] Minerals Yearbook, various years. All gas markets.

[b] Neuner, Table 16, p. 63, "Representative Natural Gas Field Prices, Large Volume Interstate Pipe-Line Market, Various Gas Supply Areas, 1945-53." Data plotted from this table and labeled "New Contract Prices." Both amounts plotted in cases of intra-year price changes.

[c] Broken line. Calculated by simple averaging of "Representative Field Prices" in order to show central tendency. No adjustment was made on basis of contract volumes.

almost 50 per cent over the previous level. The bar graph below was prepared to illustrate the changes in per cent of previous year's new contract price. It can be seen from these data that the producers in the postwar period were committing their reserves in a market which showed rather continuous price increases.[17] For this reason the producers did not wish to obligate themselves to deliver gas in the future at the price current at the time the contracts were signed.

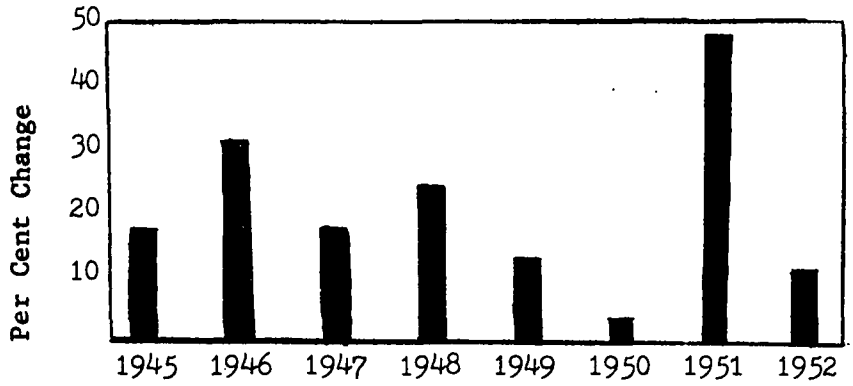


Figure 3. Per cent change to previous year's price, average of "Representative Field Prices." Calculated from Neuner, Table 16, p. 63.

Contract length became a negotiable factor in the over-all gas purchase package because of the importance of it to the two contracting parties. To get long term contracts the purchaser was required to give up something of value once bargaining power shifted to the producer. Price flexibility upwards, discussed at a later point, was one device offered by pipeline companies to obtain long term dedication of gas reserves. To gain contract certainty, pipelines sometimes negotiated

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[17]The rising field prices could be expected to feed on themselves. The anticipation of further price increases caused the producers to hold production off the market awaiting a higher price. Holding production off the market lessened the supply of gas reserves and drove the price paid by the producers upward. The higher prices paid, in turn reinforced the expectations of still higher prices and caused even more gas to be held off the market. In this way expectations of higher price to some extent made those higher prices obtainable.

definite price increases to take effect at specified times during the life of the contract. Initial prices sometimes were established at higher levels to induce the producers to forego indefinite pricing provisions. These changes were among the implications of long run contracts.

Implications of long term contracts

The long term contracts characteristic of the field market for natural gas going interstate had significant public policy implications during the pre-regulation period. The long term contracts, especially those with firm prices throughout the length of the contract, changed the allocation of natural gas among consumers and over time, and changed the distribution of income as well. Analysis of these effects of long term contracts rests on the introduction of a new purchaser into a given producing area. A model limited to one area and one new purchaser simplifies but does not alter the case of a general increase in the demand for natural gas for interstate transmission.

Effect in the field market

The new purchaser entering a supply area operates under a given derived demand for natural gas. This derived demand for natural gas is the product of the purchaser's resale market and his own cost function. The two factors determining the amount of natural gas which would be purchased at given prices reinforce one another because the lower the throughput, generally the higher the unit cost of transmission. So long as this derived demand curve is somewhat elastic the burden of the argument is unchanged.

If the field market into which the purchaser sought entry had been developed over time most of the gas reserves would be under long term contract and both prospective suppliers and prospective purchasers would be out of the market. The effect of the long term contracts would not be neutral, however, because of the upward movement of gas prices. The amount of gas demanded under long term contracts at the time the new purchaser entered the field would be greater than it would have been had those contracts not existed. This follows because the price at which

the gas was delivered under older contracts would typically be lower than the equilibrium price without long term contracts. At the lower effective price the amount demanded would be greater even if the demand for gas were the same under long term contracts as under spot markets. Similarly, the total amount of gas supplied in the developed field would be somewhat lower under the long term contracts than under the probable higher spot equilibrium price.[18] As a result, the greater the proportion of the supply of gas dedicated under long term contracts, and the lower the dedication price relative to the equilibrium price in the absence of long term contracts, the higher the price the new purchaser will have to pay to obtain a given quantity of gas from a specified field, holding external factors constant.

Economic results of long term contracts

Long term contracts in the gas field markets led to two economic results of interest to public policy. The first of these concerned economic welfare and the second the distribution of income. Long term sales contracts led to pricing of natural gas to different consumers at different prices for no reason justified by the cost of production or even by profit maximizing price discrimination. There was no opportunity for arbitrage to balance prices through a secondary market because of fixed transportation facilities. Therefore identical gas was priced differently in different consuming markets. Conceptually, one group of consumers, the marginal nonusers in the high priced consumption area,

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[18] The effect of a higher equilibrium price on supply depends on the nature of the assumptions made. If price were raised on developed reserves the only effect on amount supplied would result from improved reservoir management since the higher price would be nonmarginal in terms of development. In unexplored and undeveloped areas adjustments of supply would have far greater potential since they could affect well drilling and spacing decisions. (See Chapter II.) In this context, the higher price for old and developed areas resulting from spot prices rather than long term contracts would be counterbalanced with a lower price for new and undeveloped areas. Since marginal adjustments are potentially small in the developed areas and large in the undeveloped areas the direction in which total gas supply would move might well be downward if long term contracts were eliminated.

could have profitably compensated the other group of consumers, the marginal users in the low price area, for giving up some of the gas consumed. The existence of possible gain from trading demonstrated the absences of an optimal allocation of the gas and consequent loss in economic welfare because of long term gas sale contracts.

Long term contracts also changed the distribution of income as compared with short term or spot markets. The consumers benefiting from old low price contracts received gas at sub-equilibrium prices. The producers who dedicated gas at low prices obtained less income than they would have received had their reserves been part of the total supply for which all buyers were bidding, though the gains from earlier realization might have offset the lower price later. The producers with undedicated reserves received a higher price when the reserves were sold because of the unsymmetrical effects of long term contracts on the amount of gas supplied and demanded. The purchasers bidding for the limited supply of natural gas paid a higher price for the gas than would have been paid in the absence of prior reserve dedication. The desirability of this change in income distribution is, of course, not a matter of issue here. That long terms for gas sales contracts changed this distribution is a matter of analytical importance.

Indefinite Pricing Agreements

The effects of the long term contracts were considerably modified by the development of the indefinite pricing or escalation clauses. These clauses made their appearance in the gas field market after the upsurge in demand for natural gas resulted in rising field prices and in a strengthened producer position. The clauses established price protection to the seller by providing for an increase in price under certain triggering conditions. These clauses reduced producer reluctance to commit reserves in the face of a rising market price.

Types of escalation clauses

There were several variants on the escalation clause pattern, the distinctions between them based on the triggering mechanism. The

two-party favored nation clauses held the pipeline responsible for paying to the seller the highest price that the pipeline paid for gas purchased in the same geographic area. The third-party favored nation clause required the pipeline to pay as much as any purchaser paid who bought similar quantities and qualities of gas in a certain geographic area. While the pipeline maintained control over the price it paid in the two-party clause contracts, it did not have such control when a third-party clause was instituted.[19] A variation of the third-party favored nation clause required periodic price redetermination on the basis of the three highest prices paid in the gas supply area. Under some arrangements the pipelines were required either to share or to assume any tax increases on the commodity in the field. Under still other agreements the price of gas in the field was tied to the price received by the pipeline transporter or some index of general price movement. Whatever the nature of the price adjustment clause, if the pipeline were free to void the contract rather than pay a price increase the limits of price change were the cost of the alternatives available to the pipeline. In some contracts this freedom existed; in a majority it did not.[20]

Effects of escalation clauses

The escalation clauses in general removed to some degree the effect that long term contracts had on the allocation of resources and the distribution of income. Escalation clauses, when effective, removed

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[19]The result of the two-party clauses was probably uneconomic expansion and duplication of transmission lines because the pipeline did maintain control over prices paid. A given pipeline would be unwilling to trigger the two-party clauses in its old supply area and therefore would be willing to extend lines outside its historical purchase area to tap higher prices reserves. While the pipeline cost of line extensions was perhaps less than the cost of higher prices for all purchased gas, the social cost from unnecessary resource use would certainly lie in the other direction.

[20]The various types of escalation clauses are discussed in several works. One easily available source is Neuner, pp. 80-111.

some of the disadvantage experienced by a pipeline seeking new or expanded gas supplies. Some of the price differential among gas sales contracts was eliminated. Natural gas was therefore allocated more nearly in accordance with its value to the ultimate consumer. In this way the escalation clauses contributed to increasing economic welfare by increasing the efficiency of gas allocation.

Most attention has been given to the effect of escalation clauses on the distribution of income. Producers who sold their reserves under price escalation provisions received the benefits of rising field prices which they would otherwise have been denied. The difference in producer return represented primarily a transfer of income from the consumers of the gas to the producers.[21] These additional payments did little to alter the production decisions of producers except to cause some small adjustments in reservoir management because of the fixed nature of reservoir development. As discussed above, the new consumers benefited from lower prices and greater available gas supply to the extent that the higher prices under the old contracts choked off some of the gas sales to old customers and freed supply for higher value uses. The distributional effects of the escalation clauses, then, were not limited to increasing producer rent.

Take or Pay Provisions

The "take or pay" provision in a gas sales contract established the requirement that the purchaser pay for a certain quantity of gas each time period whether it was taken or not. The minimum take was usually stated in terms of a per cent of the face amount of the contract.[22] This provision has received little attention in the literature, either on a descriptive level or in terms of analysis of its impact. For

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[21]Some of this income, as explained in the section above, came from the undedicated reserves. Had the escalation clauses not existed the higher total demand for gas would have resulted in higher prices for the previously undedicated reserves.

[22]Eighty per cent appears to have been the typical take or pay ratio, though summary data on this point were not available.

example, no compilation of contracts in which the take or pay provision was considered explicitly has been located. The nature of the various passing references to the provision led the writer to conclude that the clause was so common in the industry as to have passed with little or no comment.[23]

Purpose of the take or pay provision

The take or pay provision was inserted into contracts for the benefit of the producers. The desirability of the clause from the producer point of view rested on three factors. First, the interstate consumption for natural gas was highly seasonal, and therefore pipelines required less gas during the summer months. Second, the independent producer had no guarantee that the pipeline would reduce its take equitably among all producers. Without a take or pay provision it would be more profitable for the pipeline to produce from its own wells or from the lowest cost reservoir. The individual producer, however, had high fixed costs relative to variable costs and therefore had an additional high incentive for rapid pay-out. Finally, in the case of co-tenancy in a pool, drainage of reserves resulted when some wells produced while others were shut in. The drainage problem was especially troublesome to the producer in a pool shared with an integrated producer which was also the pipeline purchaser. The take or pay provision was thus designed to assure the independent producer of a relatively equitable and constant share of the market for natural gas. But in doing so it exaggerated the existing pipeline load problem.

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[23]Among the fragmentary references to this issue were the following found in the literature between 1960 and 1962: Arthur K. Lee, "Introducing Supply and Demand Control for Gas Producer Regulation," Public Utilities Fortnightly, LXVII, No. 6 (March 16, 1961), p. 374; Arthur K. Lee, "Gas Confusion Unlimited," Public Utilities Fortnightly, LXVI, No. 7 (March 31, 1960), p. 444; Frederick Stueck, "Current Factors in Gas Producer Rate Cases," Public Utilities Fortnightly, LXVI, No. 3 (February 4, 1960), p. 151; "Oil men concerned, but hopeful," Oil and Gas Journal, LX, No. 3 (January 15, 1962), p. 50.

Economic effects of take or pay

The take or pay provision is particularly significant in affecting resale patterns by the pipelines. By shifting a large part of the commodity cost from the variable to the fixed categories, the take or pay provision leads to different profit maximizing marketing and pricing strategies. The following are the salient factors in pipeline marketing decisions: The pipelines are required to maintain sufficient capacity to accommodate peak demands from their firm customers. Therefore the pipelines cannot react to take or pay provisions by refusing to serve peaks to stabilize demand at relative full deliverability. Yet the very sharp peaks for which allowance must be made typically last only a few days or weeks each winter. For five months the domestic and commercial load is relatively high and stable, and for the rest of the year it is relatively low. Hence serving the demand peaks under perfect foresight would leave excess line and production capacity 98-99 per cent of the year, and highly excess capacity over 50 per cent of the year.[24] Given the fixed nature of capital and commodity costs, the marginal cost of peak service is very high to the pipelines and the cost of service at all other times is minimal. The take or pay provisions increase the costs of peak capacity.

Off-peak loads are the preferred means of raising line load factors to reduce peak costs.[25] Except for possible expansion of air conditioning loads, the major opportunity for additional summer gas sales is in the bulk energy market. In this market, advantages of cleanliness and controllability which ordinarily enable gas to obtain a premium are of minimal consequence. The price obtainable for gas is set through competition with other fuels on a delivered BTU basis. The pipelines

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[24] An alternative to excess deliverability capacity would be peak shaving capacity at the consuming end of the pipeline. Gas storage, manufactured gas, and gasification of stored gas liquids are the most important peak shaving methods available at present.

[25] A nonseasonal firm demand for natural gas would be a desirable market for the pipelines. Though such a market would not be contra-seasonal, it would increase both peak and trough sales by some amount and thereby reduce the amplitude of the peaks.

add to their net income so long as the price they receive for their gas in off-peak sales more than covers the variable costs of delivering the gas. For a company purchasing gas under a take or pay contract this price limit would possibly fall below the average cost of the gas to it in the field. Depending on the demand conditions, then, the pipeline might lose money on every cubic foot of gas it delivered to the interruptable or off-peak consumers. Other consumers would have to pay a price for gas sufficiently above the average cost of delivery to offset the losses from sales negotiated below cost. Yet the alternative of no below-cost sales would result in even higher prices to the firm consumers.[26]

Public policy implications of take or pay

The take or pay provision was the natural defense of the producer. It forced the pipelines to take some of the responsibility for

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[26]The problem of pricing off-peak gas to industrial and other consumers is beyond the scope of this paper. The FPC faced this problem directly in setting the rates in industrial sales by the pipeline companies. The so-called Atlantic Seaboard formula was adopted by the FPC as a rule of thumb in these decisions. The Commission decided in the Atlantic Seaboard case that fixed costs should be allocated 50 per cent to demand charges and 50 per cent to commodity charges. Under this ruling pipeline fixed costs were allocated to both the capacity and the volumetric services performed by the pipeline. Off-peak consumers contributed to the fixed costs of line capacity even though they did not participate in the peak demand. Their contribution was limited, however, to their share of the 50 per cent of the fixed charges which were allocated to the commodity service. Interruptable users did not contribute to charges levied on peak consumption demand. The firm service customers were left with their share of the fixed costs allocated to the commodity and with all of the 50 per cent of the fixed costs which were allocated and charged on a demand basis. In the Matters of Atlantic Seaboard Corporation and Virginia Gas Transmission Corporation, 11 F. P. C. 43, 52-57 (1952). For further information on the issues raised by the Atlantic Seaboard decision see: Arthur K. Lee, "Producer and Gas Pipeline Yardsticks," Public Utilities Fortnightly, LXIII, No. 7 (March 26, 1959), pp. 451-61; Lee, Public Utilities Fortnightly, LXV, No. 7, pp. 443-53; Lee, Public Utilities Fortnightly, LXVIII, No. 6, pp. 369-75; Stanislow H. Wellisz, "The Public Interest in Gas Industry Rate Structures," Public Utilities Fortnightly, Part I: LXX, No. 2 (July 19, 1962), pp. 65-78; Part II: LXX, No. 3 (August 2, 1962), pp. 145-56.

the seasonality in gas sales. In the absence of strong laws protecting correlative rights, it also protected the producer from possible exploitation from co-tenants in the pool. From the pipeline point of view, in turn, industrial sales below cost were optimizing behavior given the circumstances. The public policy implications of the take or pay provision, however, rested on an evaluation of the social effects of the take or pay provision itself. The first order effects of the presence of the take or pay provision, holding other factors constant, would be to increase producer income at the expense of consumers and to increase the use rate of natural gas. The desirability of these effects depends upon the values held by the evaluator and upon their further effects on other matters.

Transfer Conditions in the Postwar Field Market: A Summary

The relative advantage in the field market shifted from the purchasers of natural gas to the producers of natural gas during the postwar period. The average price of gas in the field rose from five cents per Mcf in 1945 to 14 cents in 1960. New contract commitment prices showed an even greater increase. Nor was the price change the only benefit the producers received. While the producers were unable to shorten significantly the total contract length, they were able to get the indefinite pricing agreements which reduced the disadvantage to them of the long term commitment. Take or pay provisions were also inserted in the contract and protected the producers against seasonality and discrimination on the part of the pipeline companies.

The ascendance of the producer in the postwar field market as indicated by changes in contract terms could have been due to the natural limits of natural gas supply in conjunction with the continuously rising demands exerted in the fields. Alternately, the producer benefits could have been increased by noncompetitive behavior in the field market which artificially restricted output and forced exploitative concessions on the pipelines. An examination of the competitive nature of the field market is presented below to throw some light on these issues.

Competitive Nature of the Field Market for Natural Gas

The presence or absence of workable competition among the sellers of natural gas in the field bore importantly on the general question of field sales regulation. It was noted above (Chapter III) that the absence of competition in an industry which was significant to a segment of the public brought a presumption for regulation under traditional United States public policy. The presence of considerable market power, a monopolistic element, in the field sales market would lead to a presumption for regulation of producers. The presence of competition, on the other hand, would indicate that the industry could be presumed to be adequately performing its allocative functions and regulation would necessarily rest on other motives. Cookenboo expressed the import of this issue in a statement describing the purpose of his monograph on field market competition:

> Rather our purpose is to analyze for this industry the central economic issue present in deciding whether any industry should be regulated, viz, whether there is "workable" (effective) competition present. To some, perhaps to most, economists the answer to this central economic issue would in itself tell us whether regulation is necessary. An affirmative establishment of the existence of effective competition would indicate that regulation is unnecessary; conversely, proof of the absence of competition would indicate the desirability of regulation.[27]

Neuner said on the same subject: "The main argument used to justify an extension of public price control to natural gas field markets centers on the claim of monopoly."[28]

Three independent studies of the gas field markets have examined the question of the existence and viability of producer competition. Together they covered the postwar period up to about 1958. These studies were based primarily on contract data filed with the FPC, along with other information supplied by industry sources. Two of the studies, the

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[27]Leslie Cookenboo, Jr., "Competition in the Field Market for Natural Gas," The Rice Institute Pamphlet, XLIV, No. 4 (January, 1958), p. 2.

[28]Neuner, p. 207.

ones by Neuner and by Mac Avoy, discussed the entire Southwestern field markets, dividing the region into submarkets and gas supply areas where necessary and possible. Cookenboo chose to consider the producers in two groupings, those located in the Gulf Coast markets (Texas, Louisiana, and Mississippi), and in the nation as a whole. The discussion below of competition in the field markets was drawn from these published works. The conclusions reached by the three writers are reported separately.[29]

The Neuner Study of Competition in the Gas Field Markets

Neuner isolated and described the necessary conditions for monopoly exploitation in the gas field market and then tested the market during the period 1945-1953 for the presence of those conditions. In the portion of his study devoted to a theoretical formulation of monopoly preconditions, he reported that control over only particular portions of the total supply of field gas could yield monopolistic potential. These critical portions of the gas supply were the low cost reserves or any uncommitted portion of developed supply areas.

Control over low cost gas reserves brought monopoly power limited only by the cost of noncontrolled alternatives.[30] Similarly, monopolistic control over the uncommitted reserves in a partially developed field led to possible monopoly returns even though the other portions of the gas supply were secured competitively. When demand increased, purchasing pressures were exerted only on the uncommitted reserves.[31] Under monopoly control, the price of the uncommitted

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[29]The present writer has made no independent study of competition in the gas field markets and therefore has no contribution to make on the subject. The major concerns of the present study do not depend on the structure of field market competition. Some indication of the market structure is helpful, however, and for that reason this discussion of the findings of other students of the problem is presented.

[30]Neuner, pp. 224-28.

[31]The discussion of the effect of long term contracts earlier in this chapter bears on this point. In the prior discussion competition was assumed. Here the element of monopoly is shown to push scarcity returns even higher.

reserves could be raised by an all-or-none strategy to the level just offsetting the cost of a movement to an alternative reservoir. In this way the interests which controlled the uncommitted reserves could obtain a price that was both higher than the competitive price and higher than the price which would have resulted if the previously sold gas were available to meet the total demand.[32]

In essence, these conditions delineated by Neuner merely reflected the price determining quality of the marginal source of supply. If the marginal source of supply were monopolistically controlled, any price higher than the supply price of the marginal unit produced would be reflected in all sales, just as would any other supply price at the margin. The limits to the extra-marginal supply price which could be obtained would be set by the price required to bring uncontrolled alternatives into the market. Under competitive conditions, of course, alternatives are not artificially restricted and no exploitation of this sort is possible. Exploitative field markets in the natural gas industry would require either monopolistic control or collusion sufficient to yield the same effect. To test the gas markets for these elements, Neuner first tested the concentration of the gas sellers against certain concentration benchmarks. This involved a study of the market structure. He then tested for collusion by means of comparing the experienced market behavior with the behavior anticipated under collusion.

Structure of the market

A new pipeline would be free to locate its facilities and therefore its source of supply anywhere in the nation because it would not be committed to any locality. The relevant supply market for new pipelines would therefore include the entire nation and some foreign countries under certain circumstances. Seller concentration in the production industry as a whole would determine the range of possible monopolistic exploitation of a new pipeline buyer. Neuner concluded from his study of gas sales contracts and holdings of gas reserves for the 1945-1953

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[32]Neuner, pp. 228-31.

period that the concentration of sellers in the gas industry was less than the concentration in most of the manufacturing industries in the United States.[33] He found further that the natural limitations on supply and the difficulty of entry into the production industry were not sufficient to reflect a lessening of the impact of competition as compared with manufacturing industries. Though this last finding was a matter of judgment, he decided that all matters considered, the gas production industry was more competitive than manufacturing. Neuner concluded that the concentration ratio in the gas producing industry taken as an entity was not sufficient by itself to yield exploitative gains to producers.[34]

The relative immobility of established pipelines, however, made the individual submarkets the important unit for studying the possibility of monopoly exactions from expanding demands. The four submarkets into which the Southwestern producing region was divided were geographically situated so as to minimize exit costs of buyers shifting within them. The submarkets were chosen to exhibit some degree of internal homogeneity in costs and desirability to buyers.

The concentration of producers was greater when individual submarkets were considered than when the entire Southwest was taken as an entity. Because different producers were producing in different submarkets, the smaller the market area considered the greater the concentration would appear to be. Even so, Neuner concluded that the concentration of production was not sufficient even within the gas supply submarkets to lead to significant exploitative gains. The only region in which there was a very high concentration of production, the Panhandle-Hugoton-West Texas area, contained a counterbalancing monopsonistic buyer.[35] Neuner concluded: "Generally, the level of submarket concentration is not so high that it is likely to result in a large market power based either upon differential supply costs or buyer exit-costs."[36] Therefore the structure of the field market for natural gas did not reveal a high degree of concentration.

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[33] Ibid., 239-46.

[34] Ibid., pp. 245-46.

[35] Ibid., pp. 246-51.

[36] Ibid., p. 250.

Collusion in natural gas production

Collusion, whether tacit or direct, would have offset the competitive structure of the gas supply industry if it had limited the alternatives available to interstate gas purchasers. Neuner used inferential evidence to test the market for noncompetitive behavior. As Neuner put it, "The primary clue to noncompetitive behavior is the existence of uniformities in seller actions under circumstances where such uniformities are inconsistent with the realistic functioning of a competitive market."[37]

The benefits of monopolistic control over price can only be obtained through restriction on production. This restriction is difficult to secure if a large number of sellers exist because each producer could be expected to gain in so far as he did not cooperate while others did. For this reason collusion requires policing. Neuner stated that, because of the policing problem, identical contracts are necessary to maintain collusion in an industry with a competitive structure and complex sales contracts. Diversity in contracts was taken, then, as inferential evidence of competitive market behavior.[38]

An examination of the contracts available to him convinced Neuner that contract diversity existed nationally. Historically, prices rose in a stair-step pattern, indicating a competitive response of prices to increased demand exerted first in the most desirable producing regions. The pattern followed was characterized by price pressure at one point bringing a shift of buyers to another field, where the increased demand resulted in a higher price. Over time, the price changes were transmitted in this way to all the gas supply areas.[39]

Contracts were more uniform within individual gas supply areas. Generally, however, and in all cases where the uniformity persisted, it was the pipeline buyer, not the seller, who in effect "posted" prices and contract terms. In most cases where such a pattern was observed its

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[37] Ibid., pp. 255-56. [38] Ibid.

[39] Ibid., p. 257.

source was pinpointed by the presence of other pipelines making contracts containing different conditions. To generalize, Neuner said: "The analysis of field market transactions covering the period 1945-1953 did not disclose a condition of contract uniformity which could sustain an inference of monopolistic seller agreement."[40]

Monopoly and contract provisions

The final topic considered by Neuner was the competitive implication of certain market practices. These provisions were the favored-nation clauses, the price redetermination stipulation, and the long term contract. Two questions relating to these practices were entertained by Neuner. The first of these was whether the mere presence of these clauses was an indication of noncompetitive behavior. The second was whether these devices had monopolistic potential, and if so, how much.

These provisions in the contracts were found to be perfectly consistent with a workably competitive market. Moreover, to Neuner there "does not appear to be sufficient evidence to support readily an inference of seller collusion" in obtaining favored-nation or price redetermination clauses in the contracts.[41] Whatever the source of the provisions, by themselves they had little price effect nor did they have exploitative potential. Even the two-party, favored-nation clause, the most common of all the specialized practices, was not uniform in the territory it covered. The impact of the two-party, favored-nation clause, according to Neuner, was merely to exaggerate pre-existing conditions. The basic market device which led to prices above the competitive level was the long term contract which prevented the readjustment of supply to changing demand and price conditions.[42] The long term contract, however, was essential for the protection of consumers and pipelines and was certainly not imposed by producer interests. On these points too, then, Neuner found little evidence of noncompetitive field market activity. These results were supported by the Cookenboo study to which we now turn.

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[40] Ibid., p. 260.

[41] Ibid., p. 270.

[42] Ibid., pp. 272-78.

The Cookenboo Study of Competition in the Gas Field Market

Cookenboo, like Neuner, placed most emphasis in his study on the structure of the gas production industry. In measuring concentration he utilized the individual and cumulative shares of sales of the top twenty firms in the industry. In order to consider the problem posed by long term contracts Cookenboo dealt with volume of sales committed during particular periods, total sales made, and reserve holdings.[43] His study also reflected factors affecting competitiveness which did not involve the structure of the industry.

Market structure in natural gas production

Cookenboo first examined sales to all interstate buyers in 1955 under all contracts, both old and new. His data showed that the top four sellers sold 23 per cent of the gas, the top eight sold 35 per cent of the gas, and the top twenty 54 per cent. Cookenboo noted that there were mixed biases in the compilation of sales by producer. On balance, however, these were the probable concentration levels which held in that year. Reserves held were examined for their exploitative potential. While the data were not perfectly reliable, the similarity between independent estimates persuaded Cookenboo that they were adequate as a first approximation. On the basis of these figures the distribution of reserves was similar to the distribution of sales. The Gulf Coast market, as expected, showed a somewhat greater concentration than did the interstate market as a whole. For all sales in 1955, regardless of date of contract, the top four sellers accounted for 26 per cent of the sales, the top eight for 42 per cent, and the top twenty for 67 per cent.[44]

Sales under contracts initiated between 1951 and 1955, which would reflect new dedications during the period of rapid gas price increase, did not show large differences in concentration as compared to the total of all contracts. Sales to all interstate buyers under

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[43] Cookenboo, pp. 40-47. [44] Ibid., pp. 47-58.

contracts initiated between 1951 and 1955 were divided in this fashion: the top four sellers, 20 per cent; the top eight, 33 per cent; the top twenty, 53 per cent; all others, 47 per cent. If the difference between old and new contracts was significant, it was toward lower levels of concentration during the period of the rapid increase in field gas prices. The Gulf Coast sales to interstate buyers under contracts dated 1951-1955 were distributed almost exactly the same as were such sales without reference to date, but reflected greater concentration than sales to all interstate buyers. For the Gulf Coast, the 1951-1955 data were: top four, 27 per cent; top eight, 42 per cent; and top twenty, 67 per cent.[45]

Cookenboo examined contract data for different periods before 1955 and concluded that the concentration in the field market for natural gas decreased substantially with the postwar expansion in the industry. From his study he could see no reason for greater future concentration of production as compared with 1955. He concluded that the only possibility of such a trend rested with small producers selling new discoveries to the major producers. Such sales were contrary both to experience and to expectations.[46]

Cookenboo concluded that the structure of the natural gas field market was workably competitive. The gas industry had a lower new sales concentration ratio for the top four producers than did three-fourths of the manufacturing industries in the United States. Furthermore, the top producers had frequently changed positions, with one and then another firm becoming the largest purchaser. Finally, there was freedom of entry even into the ranks of the largest producers, as illustrated by the new firms which became important in the postwar period. In Cookenboo's words,

> There are, then, many alternative sources of supply in this market; and these alternatives are real. No one firm is several times larger than the next smaller, and there are many of sufficiently large size relative to the largest to create significant competition for it. Under these conditions it would be almost inconceivable that any one seller could have any significant influence over price.[47]

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[45] Ibid., pp. 59-64.

[46] Ibid., pp. 64-79.

[47] Ibid., p. 80.

Other competitive factors

The competitiveness of the natural gas industry was viewed in the light of certain factors other than market structure. These factors were considered by Cookenboo because of the contention that they counteracted the competitive structure found in the field market.

The first argument considered by Cookenboo was that the supply of gas was determined by the exploration and development of oil. If this argument were correct, price did not influence the supply of gas but merely allocated a fixed quantity among alternative uses. In this view the total return to gas production, over confinement costs, was rent extracted from consumers. Cookenboo rejected this argument on both theoretical and statistical grounds. He said that increases in total revenue from joint products led to increased output. He pointed out further that historically the discovery and development of new gas reserves increased much more rapidly than did the discovery and development of new oil reserves when the relative price changed to favor gas. The difference between ratios of discoveries in different periods demonstrated that the product mix was variable; the direction of the change was consistent with the proposition that gas discovery responded to price variation.[48]

The second contention Cookenboo examined was that the demand for gas was inelastic and that this inelasticity prevented the effective functioning of competition. Cookenboo pointed out that the demand was in fact not completely inelastic, and even if it were, that competition would still be operative except under certain highly restrictive and unrealistic assumptions. He agreed that the somewhat inelastic demand for gas would lead to a relatively large price change in the face of altered supply-demand relations. Such adjustments were necessary to reallocate the natural gas among consumers in response to changed conditions.

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[48] Ibid., pp. 83-92. This inferential evidence is only suggestive, of course, because other factors such as the change in average well depth would have a similar effect.

But this factor in itself was no threat to competitive behavior in the market.[49]

The efficiency and vigor of pipeline bargaining were questioned by some observers of the rapid increase in gas prices in the postwar market. Admitting that little unambiguous evidence could be generated on this question, Cookenboo presented several reasons for doubting the validity of the allegation. First, a significant proportion of the pipeline sales was not regulated by the FPC and therefore the lower the field cost of gas the higher the pipeline profits. Even in regulated sales, pipeline earnings are sacrificed during the period between increased field charges and resale rate changes. Moreover, resale rate increases are not automatic and can be denied if the FPC considers the field price unreasonable. Given these possibilities, Cookenboo concluded that there was a strong presumption that pipelines were not indifferent with regard to field price.[50]

The fourth contention examined by Cookenboo was that gas production was characterized by abnormally high profits. Utilizing costs and expected returns for 1954, he found that over-all return was approximately 12 per cent, a rate in line with return in other industries. This average return hid, of course, the far higher returns achieved by some companies and the far lower returns obtained by others.[51] Though Cookenboo ignored this point, the use of current data eliminated the effect of price changes in the natural gas field markets and therefore these results did not include the producer economic rent secured from rising field prices.

The indefinite pricing clauses in gas contracts were viewed as a result of long term contracts and rising field prices. Cookenboo wrote that such indefinite pricing agreements were consistent with competition. The clauses were simply substituted for a higher initial

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[49] Ibid., pp. 93-96. For a further development of the question of the elasticity of the demand for gas in domestic uses, see footnote 7 above.

[50] Ibid., pp. 96-103. [51] Ibid., pp. 103-10.

fixed contract price. According to him, indefinite pricing contracts, when properly drawn, gave results representative of spot markets for natural gas. Cookenboo suggested that a sufficient guarantee of fair price to consumers would be provided by a pipeline escape clause added to the indefinite pricing agreements.[52]

The Mac Avoy Study of Competition in the Gas Field Markets

Mac Avoy studied the field markets for natural gas through the use of sales contract data in the Southwestern region during the postwar period. His study included contracts signed through 1958. The approach he used was to isolate the important factors in gas sale contracts and to compare them with expected behavior under different market structures. The elements studied included price, volume of gas dedicated, distance of the reservoir from the consuming end of the transmission line, term of contract, and existence of contingency pricing clauses.

The expectation was that under competitive market structures the contracts entered into would have provisions which reflected the relative desirability of the reservoir to the pipeline. That is, a pipeline would be willing to pay more for a larger volume of gas than a smaller, a closer supply than a farther, a longer term contract than a shorter, and for firm price rather than contingency contracts. Cost functions for the pipelines were obtained which estimated the observed costs of some reservoir variations. Theoretical analysis applied to other data provided not only a qualitative but in some cases a quantitative estimate of the expected value of other reservoir conditions. Noncompetitive behavior was inferred from actual contracts which did not approach the terms expected under competition.[53]

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[52] Ibid., pp. 110-20.

[53] Paul W. Mac Avoy, Price Formation in Natural Gas Fields: A Study of Competition, Monopsony, and Regulation (New Haven: Yale University Press, 1962), pp. 28-52.

Mac Avoy separated the Southwestern field market into different submarkets. He tested the contracts made between 1946 and 1958 in each submarket for evidence of noncompetitive behavior. Unfortunately Mac Avoy's methodology and findings do not lend themselves to summarization. His conclusions were that in all submarkets the contract provisions were those to be expected in the presence of producer competition. Considerable monopsony was exhibited in some regions and during some periods. Nothing that Mac Avoy found, however, supported regulation of producers on grounds of preventing or reducing monopoly returns to them except in a few, small, isolated, intrastate fields.[54]

Mac Avoy's conclusion that producer monopoly was absent from the gas field market at least through 1958 reinforced the results of the earlier studies by Cookenboo and Neuner. The finding that monopoly was absent gave rise to the question of the need for federal regulation since much of the popular argument for regulation rested on the supposedly monopolistic position of gas producers. In this study, of course, the goals of regulation posited have been broader than redistribution of income toward consumers and away from producers. Even so, the evolution of FPC jurisdiction in the absence of a clear indication of monopoly is of interest. In the next chapter the evolution and scope of FPC jurisdiction over field sales is examined to point up the background of the regulatory issues which have continued to create both policy and administrative problems.

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[54] Ibid., pp. 243-52.

CHAPTER V

EVOLUTION AND SCOPE OF FPC JURISDICTION OVER FIELD SALES BY INDEPENDENT PRODUCERS

The federal regulation of the independent producer of natural gas at issue in this study extended only to the sales for resale in interstate commerce. The question of federal jurisdiction, then, centered on the field markets, some of the salient characteristics of which were discussed in the last chapter. Field sales thus defined included only sales of gas when production control was maintained by the independent producer. In-place sales of gas to interstate transmission companies did not fit in this category, and neither did intra-company gas transfers.[1] Gas sales in intrastate commerce were similarly excluded. Consideration of the nature and direction which the regulation of field sales for resale took is left to a later point in this study. In this chapter attention is focused on the development of the federal jurisdiction over field sales thus defined, and on the scope of authority exercised by the FPC as of the end of 1962. Passing references to other jurisdictional issues are included to provide a somewhat rounded picture of FPC activities.

The Phillips decision, which granted the FPC jurisdiction over the field sales of natural gas for resale in interstate commerce, extended social control to the last unregulated segment of the natural gas industry affecting domestic and commercial interstate consumers. A survey of the development of field sales regulation culminating in this decision

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[1] FPC supervision of in-place sales to the pipelines is exercised primarily by certification procedures.

was undertaken and is presented here not only to provide insights into some natural gas regulatory problems but also to point to the source of some of the issues which even now cloud independent producer regulation. In this portion of the study the jurisdictional questions considered lead to a primary emphasis on the legal and political elements of the conflict and their economic implications. The constitutional and statutory limit of federal authority is the first matter considered under this heading.

Constitutional and Statutory Issues in FPC Jurisdiction over Field Sales

The authority of the FPC, like that of any other federal agency, was derived from both the Constitution and the enacting statutes. Constitutional approval of any federal activity requires that the contemplated action fall within the ambit of the enumerated or implied powers of the United States government and that it does not encroach on the powers left to the states or to the people. Within these constitutional limits the Congress can establish, generally with the approval of the President, an agency with such powers and jurisdiction as Congress deems necessary for the general welfare. The FPC authority over the natural gas industry, then, fell within two boundaries, the outer of which, superior in case of conflict, consisted of the constitutional limits on federal power and the inner of which consisted of the delegations of authority actually granted by Congress to the FPC. Those boundaries were defined, as they are with any law, by the interpretation given the Constitution and the statute by the courts. The actions and refusals to act of the courts on particular cases establish the law pursuant to a particular statute. The jurisdiction of the FPC over the field sales contract between independent producers and the interstate transporters was settled through just such a process of litigation. The constitutional and statutory issues about which this litigation centered are discussed before the litigation itself is reviewed in the context of the field markets.

Constitutional Authority

The constitutional authority of Congress to regulate the production and gathering of natural gas by independent producers and the sale for resale of such gas destined for interstate markets is scarcely ever questioned. Production and gathering is part of the process of delivering gas to users across state lines. The gas moves in an unbroken stream from the time it leaves the bottom of the well until it reaches the city gate. Since a reservoir is physically one entity, the connection of one well to an interstate pipeline creates a condition where federal authority can be exerted over the entire reservoir. The business of supplying gas to consumers interstate is by its very nature interstate commerce, and under the Constitution the federal government is charged with the responsibility of regulating such commerce for the common good. As Justice Douglas said in his dissenting opinion in the Phillips case, "There is much to be said from the national point of view for regulating sales at both ends of these interstate pipelines. The power of Congress to do so is unquestioned."[2]

Statutory Authority

The legal controversy over federal regulation of the gas industry at the field sales level was centered on the scope of the legislative grant of authority. Paragraph 1 (b) of the Natural Gas Act (discussed in Chapter III) stated that the Act would apply to the "sale in interstate commerce of natural gas for resale for ultimate public consumption for domestic, commercial, industrial, or any other use, and to natural-gas companies engaged in such transportation or sale . . ."[3] This statement standing alone gave jurisdiction to the FPC over the sale of natural gas by independent producers to pipelines for resale to distributors.

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[2] 347 U.S. 672, 688. (Emphasis supplied.)

[3] 52 Stat. 824 (1938); 15 U.S.C. 717-717w.

Industry and other spokesmen have accepted this positive statement of the Act as holding that independent producers were so covered.[4]

The grant of authority in the Act was followed, however, by a restriction worded "but shall not apply to any other transportation or sale of natural gas or to the local distribution of natural gas or to the facilities used for such distribution or to the production or gathering of natural gas."[5] The phrase "other transportation or sale" referred to industrial sales by the pipelines which were exempted from control. Local distribution control was left to the consuming localities. The last phrase, "or to the production or gathering of natural gas" was the source of conflicting interpretations of the scope of FPC jurisdiction. There were three possible interpretations of the Act's production and gathering exemption. The first was a loose interpretation of the exemption to the effect that both production and gathering and results flowing from it were exempt from regulation. This interpretation excluded integrated company production from regulation. Approval of the loose interpretation of the exemption would have placed the commodity value of the gas transported beyond the reach of the FPC and in this way would have nullified the intent of the Act to protect consumers from exploitation. Early decisions held production and gathering activities of integrated companies subject to FPC jurisdiction despite the negative statement.[6]

The second possible interpretation of the production and gathering exclusion supported the regulation of the integrated producer on grounds of practical necessity. The sales made by independent producers, however, were excluded because they were part of the production and gathering phase of the industry which was specifically exempt from FPC jurisdiction. This interpretation perhaps did not make a distinction between regulation of production and gathering as a physical process and regulation of the sales for resale by the producer as a commercial

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[4] Smith-Wimberly Report, p. 156.

[5] 52 Stat. 824 (1938); 15 U.S.C. 717-717w.

[6] Billings, 2 F. P. C. 288 and other early decisions of the FPC.

transaction in interstate commerce. Alternately, recognition of the difference between the physical and commercial functions was consistent with denial of FPC jurisdiction if the two were presumed to be so joined that regulation of one could not be accomplished apart from regulation of the other.

The third interpretation was that the production and gathering exemption did not apply to sales by producers for resale to ultimate consumers across state lines. In this view the exemption was designed to reassure the industry and the producing states that the FPC had no power to do what it was not intended that it should do in any case--assume jurisdiction over facilities for production and gathering and thereby supplant the state's authority in such fields as conservation and safety regulation. This interpretation limited federal control to the interstate gas sales contract. Essentially local matters were left in local hands, but the FPC was given sufficient authority to protect the vital interests of consumers. It was this latter interpretation that ultimately prevailed, but only after a series of administrative and judicial decisions, the first of which involved Columbian Fuel Corporation.

Formation of Early FPC Policy toward Independent Producer Sales: The Columbian Case

The FPC, in a policy formed in the early years of gas regulation, favored an interpretation of the Natural Gas Act which denied it jurisdiction over independent producer sales. This interpretation was expressed in the Commission decision in the Columbian case.[7] The reasoning which lay behind this decision guided the Commission until court actions made it no longer tenable. Similarly, the objections to it presented by a dissenting Commissioner retained their basic applicability throughout the long controversy over regulation of sales in interstate commerce for resale. The Columbian decision had both a practical and a historical impact in the evolution of FPC jurisdiction over field sales by independent producers.

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[7] 2 F. P. C. 200.

Columbian was an independent producer operating solely within the confines of Kentucky. The FPC issued an order on October 31, 1939, suspending changes in the price of natural gas furnished by it.[8] Columbian sought to have the order dismissed and a hearing on the question was set. The facts were that Columbian sold gas to Warfield Natural Gas Company at the terminus of Columbian's gathering lines. The gas purchased by Warfield was consumed both within and without the state of Kentucky. It entered into interstate commerce within the legal meaning of that term, following "a regular unbroken and uninterrupted transmission and a continuous flow."[9]

Columbian maintained that it was solely a producer and gatherer of natural gas and therefore not under the jurisdiction of the Federal Power Commission because of Section 1 (b) of the Act. The Commission decided that the question of jurisdiction must rest on three elements: 1) the language of the Natural Gas Act, and its legislative history including 2) the Congressional committee report on the bill, and 3) the floor debate.

Interpretation of the Production and Gathering Exemption

The Commission majority held that the positive statements in the language of the Act left the producers and gatherers under FPC jurisdiction and that the negative language in itself was not sufficient to exclude them. While jurisdiction over production and gathering facilities seemed contrary to the spirit of the Act, direct statements in the Act pointed to specific Commission powers which prevented the Commission from completely ignoring these activities.[10]

The committee Report accompanying the natural gas bill stated that Commission authority encompassed all phases of an integrated

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[8] Unnumbered order reported in 2 F. P. C. 200, 201.

[9] 2 F. P. C. 200; 202-203.

[10] Ibid., pp. 203-204.

company's operations, including production and gathering.[11] According to the Commission majority, Congress had an oversimplified impression of the natural gas industry and viewed control over the transporting companies and their producing and gathering operations as the only regulation needed. For this reason, it was concluded, no direct reference to sales for resale in interstate markets by independent producers was included.

The last of the sources of interpretation of the Natural Gas Act, floor debate on the bill, was cited by the Commission as reinforcing its judgment that sales by independent producers were nonjurisdictional. Again the Commission majority emphasized that the Congress acted on the assumption that the transporting natural gas companies were the only commercial link in the movement of gas from the reservoir to the city gate. This one link, the integrated natural gas company, was to be regulated to fill the regulatory void beyond the city gate. The intention of the Congress was thus somewhat different from the face of the Act. Regulation of sales for resale by independent producers was not so much enjoined by the Act as it was ignored. The majority of the Commissioners interpreted the will of the Congress in these words:

> Clearly, Congress thought it was closing the gap in regulation of the natural gas industry by providing Federal Power Commission regulation of companies whose main function was to transport natural gas through interstate pipelines and sell gas so transported at city gates for resale to ultimate consumers.
>
> The companies to be subjected to regulation were conceived of as "pipeline" companies, and it was assumed that production and gathering would enter the field of regulation only to the extent that the "pipeline" companies, either directly or through affiliates, controlled the production or gathering of the gas so transported.[12]

Substantive Arguments for Nonjurisdiction

Inquiry into the jurisdictional question would have ended with interpretation of the statute had the wording of the Act and the intent

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[11] Ibid., pp. 205-206, citing Report of Committee on Interstate and Foreign Commerce Re: Natural Gas Bill.

[12] Ibid., p. 207.

of Congress been the only factors of importance to the Commission. Actually, however, the Commission went on to present the substantive arguments undergirding its decision in the Columbian case and its policy with regard to the industry. The proposition that regulation of sales for resale at the field level was inseparable from regulation of production and gathering was fundamental to the Commission's arguments. The Commission pointed out that it must consider the interrelationships between the gas and oil industries to properly regulate production and gathering by independent producers. Since the required appropriations and authority to investigate the connection between these joint products was lacking, the Commission majority held that as a practical matter it could not regulate independent producers, whatever its legal jurisdiction.

The philosophy of regulation followed by the Commission, and its view of the industry, further encouraged a finding of nonjurisdiction over independent producers. In the Commission's words:

> If, as intimated by Representative Lea, [the House sponsor of the natural gas bill and its co-author] the justification for regulation lies in the monopolistic character of the wholesale rates charged for natural gas, the necessity for regulating the price at the well mouth or at the end of gathering lines exists only to the extent that such prices are fixed on a monopolistic basis or by interests with sufficient control in a given field to weaken the force of competition. The record in the present case does not show such control.[13]

The next paragraph, read in conjunction with the one preceding, left open the question of the possible regulation of some producers and gatherers of natural gas if conditions were other than those prevailing in the field markets where Columbian operated.

> We conclude, therefore, that it was not the intention of Congress to subject to regulation under the Natural Gas Act all persons whose only sales of natural gas in interstate commerce, as in this case, are made as an incident to and immediately upon completion of such persons's production and gathering of said natural gas and who are not otherwise subject to the jurisdiction of this Commission.[14]

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[13] Ibid. [14] Ibid., p. 208. (Emphasis supplied.)

The Commission majority did not completely renounce jurisdiction over production and gathering. In its closing statements it held that the final decision on the necessity for federal authority over independent producers rested on FPC experience in the performance of its mission.

> Further experience with the administration of the Natural Gas Act may reveal that the initial sales of large quantities of natural gas which eventually flows into interstate commerce are by producing or gathering companies which, through affiliation, field agreement, or dominant position in a field, are able to maintain an unreasonable price despite the appearance of competition.[15]

It should be noted that the only justification for field sales regulation apparent to the Commission was excessive price maintained by sheer market power. Other possible regulatory goals were not considered.

The Dissent in the Columbian Case

Commissioner Scott dissented vigorously from the majority opinion in the Columbian case.[16] He based his objections to the ruling opinion on both legal and policy grounds. The basic intent of Congress, according to Scott, was to protect the ultimate consumer by using federal action to fill the regulatory void beyond the city gate. That purpose was not served if independent producer sales were not regulated. Scott argued that Congress intended to exempt companies engaged in production and gathering of natural gas unless they also sold gas in interstate commerce. All companies which did make such sales, however, were natural gas companies and were subject to FPC control. Facilities and productive activities were left outside FPC jurisdiction by the law, but the sale of gas for resale in interstate commerce was not. In support of this functional division of jurisdiction Scott cited as precedent the Carter v. Carter Coal Co. case [298 U.S. 238 (1936)]. The decision in the Carter case rested, in turn, on reasoning in such other cases as: Oliver Iron Co. v. Lord [262 U.S. 172, 178]; Champlin Rfg. Co. v. Corporation Commission [286 U.S. 210, 235]; Utah Power and L. Co. v. Pfost [286 U.S. 165, 182]; and Chassaniol v. Greenwood [291 U.S. 584, 587].[17]

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[15] Ibid. [16] Ibid., pp. 209-217. [17] Ibid., pp. 212-213.

Scott disagreed with the majority that the report accompanying the Natural Gas Bill supported nonregulation of field sales of natural gas for resale. Moreover, he also said that the report was not admissible as an interpretation of the Act, no matter what its impact. In his view, the Commission could not go beyond the language of the Act to seek other interpretive authority.[18]

Commissioner Scott favored independent producer regulation on policy grounds. The objection raised by the majority that such control was not feasible was rejected by the dissenting Commissioner. He suggested administrative rules restricting regulation to the larger and the more important producers. This limitation would reduce the practical and administrative difficulty of regulating many small producers without severely reducing the effectiveness of control. An analogous restriction in enforcement of the system of uniform accounts was referred to for precedent.[19]

Scott did not rest his policy case on the negative recognition that regulation was practical. The situation that he saw and expected from the future course of events caused him to regard effective regulation of producer field sales as of the greatest importance. In his strongly worded conclusion he warned:

> The practical consequences of the action of the majority in the instant proceeding cannot be overemphasized. I fear there will accrue from this action results substantially curtailing our ability effectively to regulate in the public interest interstate sales of natural gas for resale. . . . it is obvious that the consuming public cannot be as well protected from any exploitation in the rates it is charged, unless there is an exercise of Federal authority under the commerce clause of the Constitution.
>
> . . . . . .
>
> I cannot help but feel that the majority opinion leaves adequate and effective regulation, in the public interest, of the sales of natural gas in interstate commerce for resale, hoped for by the consuming public and deemed essential by a Congress desiring to fill the gap in which the States may not act, suspended in limp and lifeless form from the yardarm of inaction.[20]

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[18] Ibid., pp. 214-215.

[19] Ibid., p. 216.

[20] Ibid., p. 217.

The Columbian Case in Perspective

The goal of the FPC in the years during which gas regulation policy was being formed was to keep gas prices to the ultimate consumers as low as possible. Other goals which might have been followed included efficient allocation of the natural gas and provision for important national interests. Yet the FPC limited its jurisdiction to the transmission phase of the industry without attempting to control the field prices charged by independent producers. Some perspective on the prewar field market is required to explain the equanimity with which the Commission accepted denial of jurisdiction over independent producers. The record indicates that the limitations on FPC jurisdiction in this regard were primarily due to the absence of any clear advantage to any significant group from such regulation. This condition changed, of course, in the postwar period.

The domestic consumers had no reason to press for FPC jurisdiction over independent producers because the field price of natural gas was quite low and falling. For twelve of the thirteen years preceding the Columbian decision average field price of natural gas had fallen, and the year that it had not fallen it remained constant. The average field price of natural gas was at an all time low in 1940.[21] Moreover, at this time much of the natural gas utilized, and a much larger proportion of that originating in the high price fields near the consuming centers, came from already regulated integrated production. Extension of the rate-base method of price setting to the independent producers in the Southwestern field markets would probably have raised gas prices since a large number of the producing properties were not covering full costs.[22] The failure to exert jurisdiction to adjust the distribution of income was consistent under these conditions with the Commission dedication to

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[21]Table H in the Appendix contains data for some years. Averages for all years were taken from the Minerals Yearbook, various years.

[22]See Chapters II and III above for an explanation of the low gas prices in the Southwestern field markets.

lower gas prices for consumers. The Commission did not want to face a possible court fight for jurisdiction over an activity which it was not staffed or equipped to handle, which would pose enormous technical and legal problems, and from which little gain in consumer protection could be foreseen. Even Commissioner Scott argued more in terms of future effects than in terms of the Columbian case itself.

Changes in the allocation of natural gas through regulatory changes in its field market price were not in the apparent interest of either consumers or producers. The reservoir price of gas did not restrict or ration its consumption because in economic terms the commodity in the reservoir was in many respects a free good, discovered as a by-product of the search for oil. Increases in price were not necessary to bring more reserves into being because reserves were abundant. The field price of gas, then, determined only the maximum costs of confinement and capture which could be sustained in the production of known reserves. Reductions in price could be expected to result primarily in reduced confinement of gas so that supplies to consumers would fall--even though reserves and perhaps even withdrawals remained constant. Reduction in consumption through higher price, on the other hand, would not have automatically had the effect of making gas available for higher value uses over a longer period of time. Associated gas, produced with oil, would be wasted without a market and the potential contribution to economic development of gas not produced would be thwarted. The allocation decision for a significant portion of the gas was not between future and present consumption alternatives, but between present consumption and venting, flaring, or underground waste.

The only group seriously advocating restrictions on natural gas consumption was made up of the competing fuel interests. These interests sought to limit the use of natural gas because it reduced the potential market for the competing fuels, especially coal. Arguments on these grounds were not convincing to the consumers or to the agencies responsible for consumer welfare. Even if the social validity of the competing fuel position were granted, the lack of broad political appeal explained its failure to influence the prewar regulation of natural gas production.

The last prewar FPC report to the Congress, that for 1940, expressed the general FPC satisfaction with its authority through omission of specific requests for widened jurisdiction. The FPC did not request clarification of its role in field sales regulation either. It did seek other extensions of power, however, including control over construction of all natural gas lines, control over direct sales to industrial consumers, and authorization to publish statistics on natural and manufactured gas. In this same report there was a mention of a possible future multi-dimensional approach to natural gas regulation. The Commission specifically commented on several potential problem areas. Among these were the conservation of natural gas and the prevention of waste, the inter-industry fuels competition issue, and the use priorities to be ascribed to types of gas consumption. Issues other than low rates were considered by the Commission, but its decision was that the situation at the time of the report was not such as to demand federal action.[23] Conditions in the industry at the time of the next full-scale annual report, that for 1946, were quite different.[24]

Postwar Conditions: The "New" Natural Gas Industry and Its Regulation

The close of World War II marked the recognition of the birth of a "new" natural gas industry. Conditions had changed so rapidly during the war induced period of regulatory quiescence that the cumulative changes of the period when reviewed as a whole appeared revolutionary. Regulatory activities of the FPC were limited during the Second World War because most of the energies of the nation were devoted to the war effort. After the war, the Commission faced drastically changed public policy

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[23] Twentieth Annual Report, pp. 9-10, 79-80.

[24] Federal Power Commission, Twenty-Sixth Annual Report, 1946 (Washington: U. S. Government Printing Office, 1947), pp. 9, 60. The Commission published only the statutory minimum of reports during the war. No formal annual reports were made and no far reaching statements of regulatory policy were issued.

issues brought on by expansion in the market for natural gas, a revised balance between available supply and existing and potential market, structural changes in the industry, and the growing pains of an industry trying to catch up with long deferred demands.[25]

The changes in the industry between the close of World War II and 1960 were even greater. These changes, the magnitude of which is indicated in the first section below, brought forth regulatory responses by the FPC. The FPC did not ignore the fact that regulation designed to meet prewar conditions was not completely suited for the regulation of the new industry developing in the postwar period. A general investigation into the industry had been initiated even before the close of the war. Salient features of the reports filed at the close of this investigation are noted in the second section below. New FPC policies arose from this investigation and from temporary emergencies which made it necessary to develop short run expedients. The Commission also recommended changes in legislation to meet the problems presented by shifts in industry operations. The most important of these changes was the extension of FPC jurisdiction to include some interstate sales in the field by independent producers. These alterations are also surveyed in this chapter.

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[25] Ibid., pp. 9, 60. The Commission, commenting on this upsurge in demand, had this to say:

> "The expansion in the use of natural gas for space heating came so rapidly following the removal of war restrictions on natural gas appliances, that it proved impossible for the natural gas pipe line companies to secure sufficient pipe to expand capacity rapidly enough to meet the demands." (p. 9)

> "These increases in the applications for construction permits were due to unprecedented demands by the public for natural gas service. Such increased demands were brought about largely by increases in prices of other fuel, inconvenience caused by shortages of other fuels during the war, postponement of normal pipeline construction and extensions during the war because of material shortages, and action by the Federal Power Commission in reducing wholesale rates of pipe line companies. In addition, depletion of local natural gas supplies in certain areas, particularly the Appalachian area and California, have necessitated the construction of pipe lines to move plentiful gas supplies." (p. 60)

The Postwar Change in the Natural Gas Industry

Physical measures alone are never sufficient to reflect a basic industry change because change is not limited to measurable qualities. There is also the change in attitude, response, and general "feel" of an industry or institution. Nevertheless, comparisons of magnitudes, whatever their shortcomings, do give a picture of the basic alterations in the natural gas industry between 1945 and 1960. Such comparisons are made below through reference to data presented in the text and in Appendix tables.

Production of natural gas

The production of natural gas rose rapidly following the end of World War II. Production in 1938, at the time of the passage of the Natural Gas Act, was approximately 3,048 billion cubic feet.[26] By 1945, production had not quite doubled to 5,902 billion cubic feet. This increase came over a seven year period. In 1952, after the passage of another seven years, production was up to 10,984 billion cubic feet; in 1960, 15,088 billion cubic feet were produced.

Throughout this period, and despite the gross withdrawals of natural gas, the proved recoverable reserves grew as well. In 1945, the first year in which reasonably consistent data were available on this subject, there were proved recoverable reserves of approximately 150,000 billion cubic feet. By 1960, however, there were approximately 260,000 billion cubic feet of natural gas in proved recoverable reserves. The recoverable reserves figure is peculiarly susceptible to inconsistent definition. Changes in its level, while indicative, should not be interpreted as having any great precision, even with reference to the imprecise definition of what is "proved" and "recoverable." Notably, however, the

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[26] All data in this section were taken from Minerals Yearbook, various years. Information on gas withdrawn, marketed, used for repressuring, and vented and wasted are also found in Table D of the Appendix. All measurements are reported in standard pressure, temperature, and purity units.

life of "proved" recoverable reserves at the 1945 marketed production rate was approximately 38.5 years in 1945, while the index for 1960 had dropped to 23.7 years. By 1962, using preliminary figures, the life index had fallen to 20.7 years.[27]

Disposition of natural gas

The disposition of the increased amount of natural gas produced was altered in the postwar development of the natural gas industry. The switch in the postwar market was toward the higher valued uses and toward interstate rather than intrastate consumption. The two drifts, of course, were related.

The increase in interstate use of natural gas by domestic and commercial consumers was made possible by the rapid expansion of pipeline facilities beginning in 1946. A similar proportionate increase in intrastate sales was not possible. Most potential consumers within the producing regions were already served by gas. Some expansion of sales took place in the Southwest following the war, for example when appliances became available to meet rising demands brought on by higher consumer incomes, but this expansion was relatively small. Since the greatest expansion of gas sales was in the interstate markets where transportation costs limited gas consumption to high value uses, a relative shift away from lower value industrial uses was to be expected in the postwar market.

The data bore out the expected shifts in consumption. In 1938 domestic and commercial consumption of natural gas accounted for approximately 21 per cent of gas by volume consumed, with industrial use accounting for the remainder. By 1960, however, the domestic and commercial consumption of gas had risen to 33 per cent of the total quantity. The postwar period accounted for practically all of this gain because in 1945 domestic and commercial consumption was only 21.5 per cent of the total.[28] Within the industrial sector, the consumption of gas in the

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[27] See Table B in the Appendix; for 1962 data see Oil and Gas Journal, LXIX, No. 4, p. 169.

[28] Percentages calculated from data published in Minerals Yearbook, various years. Basic data on gas use are reported in Appendix Table D.

manufacture of carbon black went up from 325 billion cubic feet in 1938 to a high of 441 billion cubic feet in 1948. It soon fell after that, however, and was just under 200 billion cubic feet in 1960. Relatively speaking, of course, the use of gas for carbon black manufacture fell consistently because of the rapid rise in other uses of natural gas.[29]

The proportion of gas shipped interstate increased in each of the years considered except for 1945 when the expansion of the interstate gas transmission system had been delayed because of the war. Table 1 below points up the shift in disposition of gas.

TABLE 1

NATURAL GAS MARKETED AND SHIPPED INTERSTATE IN BILLION CUBIC FEET AND PER CENT, UNITED STATES, SELECTED YEARS, 1933-1960[a]

Year	Marketed Production	Shipped Interstate	Per Cent Shipped Interstate
1933	1,556	347	22.3
1938	2,296	637	27.7
1945	3,919	1,106	28.2
1948	5,148	1,757	34.1
1952	8,013	3,795	47.3
1954	8,743	4,662	53.3
1956	10,082	5,628	55.8
1960	12,771	7,544	58.8

[a]Data taken from Minerals Yearbook, various years. Some other data are found in Table B of the Appendix. Per cent calculated from data.

The increase in the interstate transportation system during the postwar period made it possible for a larger number of consumers to be served with natural gas. In 1938 the total number of consumers was approximately 9.3 million. The seven years to 1945 saw an increase of

[29]Table D in the Appendix contains data for most of the years cited.

only 2.5 million to 11.8. During the first three years after the war, shortages continued to hold back consumer connection growth, but between 1948, when consumers numbered 14.7 million and 1952 the connections increased 9.7 million to 24.4. Growth slowed after 1952 and the next eight years saw only 9.3 million new natural gas users added to the distribution systems.[30] The shift to higher value uses, to larger number of consumers, and to interstate markets was accompanied, as to be expected, by an increase in the average price of gas both in the field and in the consumption markets.

Price of natural gas

The price of natural gas rose following World War II, but the rise was not steady. The discussion in Chapter IV above dealt with the rise in gas prices in the field markets. The change in price of natural gas in various consumption uses exhibited less rapid and less consistent upward changes than did average gas prices in the field. Table H of the Appendix contains average price data for various consumption uses of natural gas, along with field price averages. The influence of a different "product mix" on the price of natural gas in consumption uses should be noted in interpreting the gas price increase. The consumers were, on average, getting a greater proportion of a more costly service after the war than before. The expansion in interstate transmission of gas increased the average distance gas was hauled between field reservoir and burner tip, which meant higher transportation costs.

Value of natural gas

The greater production and consumption of natural gas and the higher price combined to increase the total sales of gas both in the field and in consumption uses. The value of natural gas sold in the field rose from $114 million in 1938 to $1,790 million in 1960. The value of natural gas in consumption uses rose rapidly as well. The total value in consumption, as estimated by the Bureau of Mines, amounted to only about $368 million in 1933. By 1938, however, the value of gas

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[30] Minerals Yearbook, various years.

in use had risen to $501 million, or an increase over 1933 of approximately 36 per cent during the five year period. In the twenty-two years between 1938 and 1960 the value of natural gas consumed rose $5,770 million, to $6,270 million, for an increase of approximately 1150 per cent. The average value increase calculated in this manner was 7 per cent a year during the first period and 52 per cent a year during the second. While the amount of gas consumed and the value of that gas was increasing very rapidly, the distribution of the value of that gas remained relatively stable among different classes of consumers. Industrial sales brought approximately one-third of the sales income, and domestic and commercial two-thirds. This constancy existed despite the shift to greater proportionate consumption of gas by domestic and commercial users. The seeming inconsistency was explained by the shift within the industrial sector toward higher value uses which increased its proportion of dollar sales while physical consumption was declining relatively. Similarly constant was the proportion of the domestic and commercial gas sales attributable to domestic consumers, about 80 per cent. It was approximately 80 per cent between 1938 and 1960. Within the industrial sector the changes were somewhat greater, with the growth in some sales, notably fuel use, far outstripping sales for carbon black manufacture and field use.[31]

Regulation Adjustments to Industry Expansion: The Natural Gas Investigation

The vast changes in the natural gas industry reflected in the data presented above brought with them adjustments in regulation and in the regulatory process. No direct and perfect correlation between changes in field price, say, and movements toward regulation of independent producers can be traced. Nevertheless, the changes in the industry certainly created conditions wherein the FPC was forced to consider the suitability of its policies. The Natural Gas Investigation provided a formal opportunity for a re-evaluation of all FPC policies.

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[31] Ibid. Data reported are also found in Appendix Table H. Percentages calculated from these data.

The Natural Gas Investigation, which was initiated by an order of the FPC on September 22, 1944, gave all interested parties an opportunity to express opinions on regulatory policy for the "new" natural gas industry.[32] It was a sounding board for the opposing theories of the approach to regulation appropriate to the FPC. The basic nature of the disagreements which came to the surface in this investigation was indicated by the filing of conflicting reports, one by Commissioners Smith and Wimberly and the other by Commissioners Olds and Draper. The differences between the Commissioners frequently rested on different value orientations and on different views of the role of regulation in the natural gas industry. For convenience in designation, Commissioners Smith and Wimberly were labeled "industry oriented" while Olds and Draper were "consumer oriented." These positions were more or less visible in the conflicting reports, dealt with separately below.[33] The investigation covered the whole range of regulatory policy. Conflicting views of the appropriate regulation of the gas produced by the integrated natural gas companies, an important part of the investigation, has already been discussed.

The Smith-Wimberly Report: independent producer regulation

Commissioners Smith and Wimberly concluded from their study of the gas industry that the FPC did not have the authority to regulate the

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[32]The Investigation, designated Docket No. G-580, was instigated by an order which stated its scope as: "the extent and probable life of natural-gas reserves; present and prospective measures for preventing waste and prolonging the life of such reserves; the present and probable future utilization of natural gas for domestic, commercial, and industrial purposes; the extent, character, and results of the competition of natural gas with other fuels; and such related matters as may be helpful in the administration of the Natural Gas Act or in determining what additional legislation, if any, should be recommended." Smith-Wimberly Report, p. 1.

[33]These labels, like all short cut designations, are subject to the danger of oversimplification. Their use should be interpreted with care.

sales for resale in interstate commerce by independent producers, that it did not need such power to fulfill the function of protecting the consumer from exploitation, and that actual harm would result from such regulation if it came to pass. They suggested that legislation settling the matter once and for all be passed by the Congress to reassure those who had wrongly become exercised over the possibility of FPC control over independent producers.[34]

These Commissioners found no evidence in the Act that there was any intent to separate the activities of production and gathering from the sales for resale. From this conclusion the further inference was drawn that the Congress intended some force for its negative "shall not apply . . ." phrase. Since it was impossible to separate production and gathering from sales of the gas produced and gathered, and since there was to be some meaning attached to the production and gathering exclusion, sales by producers and gatherers were not jurisdictional. The legislative history of the Act was cited to demonstrate that in certain statements Congressmen and some of the witnesses apparently interpreted the Act as excluding control over the selling price of arm's-length independent producers. Smith and Wimberly concluded that the Commission had consistently and properly held to the position first enunciated in the Columbian decision, and that the courts had upheld this interpretation.[35]

The second point made by the Commissioners was that authority existed to achieve by other means any of the potential gains of direct independent producer regulation. The Commission was empowered to look behind any contract not negotiated at arm's-length. It was obligated by law to disallow as a cost of service any improper payment by a natural gas company, including exorbitant payments to independent producers. Finally, they held, if monopoly or concentration existed in the field markets the proper remedy was to initiate antitrust action.[36]

The final point raised in the Smith-Wimberly Report was that FPC control of the independent producers would harm the cause of state

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[34] Smith-Wimberly Report, p. 173.

[35] Ibid., pp. 7-8, 155-65. [36] Ibid., pp. 8, 172.

regulation and would usurp regulatory powers more properly remaining in local hands. This conclusion was reached because the Commissioners felt that no regulation of the independent gas producers was possible without coincident regulation of associated oil and oil pipeline operations.[37] Regulation of oil and gas production and gathering, in turn, would impinge on state regulation of conservation and state protection of correlative rights. While the state regulation might be improved, the nature of the task led to preference for local control unless there was a future breakdown in state control in this field. Any federal incursion would require, according to Smith and Wimberly, Congressional action.[38]

The Smith-Wimberly Report: general findings

Smith and Wimberly sought to restrict the role of the FPC to the minimum of regulation consistent with their somewhat limited goals. Their goals were expressed as follows: "The essential purpose of regulation is to see that the rate and service conditions under which natural gas is provided are reasonable and non-discriminatory."[39] Yet these two Commissioners also reported that it was necessary to consider the effect of price on use and on depletion of the gas supply, certainly factors beyond the range of simple utility regulation to avoid undesirable income distribution effects. While not advocating FPC action, Smith and Wimberly urged the industry to sell only to firm demand customers in industrial and other uses where the quality of service and the convenience and special properties of gas were so valuable as to justify a price high enough to amortize the additional transmission investment.[40]

The Smith-Wimberly Report accepted the need for higher field prices for natural gas to encourage conservation. The added use of casinghead gas to save the nonassociated gas for future use, conservation

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[37] This conclusion followed from the refusal to distinguish between production and gathering and commercial sale for resale.

[38] Smith-Wimberly Report, pp. 8, 166-78.

[39] Ibid., p. 15.

[40] Ibid., pp. 16, 352-54.

programs, and research on the development of alternative gaseous fuel sources were also urged.[41] In sum, Smith and Wimberly, like Olds and Draper, recognized that the performance of the natural gas industry was not completely satisfactory judged by public welfare criteria. But these two Commissioners restricted themselves to the role of vocal critics without seeking by their actions to remedy the faults found except in certain areas. Olds and Draper were more activist in their prescriptions for the industry.

The Olds-Draper Report: independent producer regulation

Commissioners Olds and Draper supported a broader interpretation of the public interest in natural gas industry regulation. In terms of the independent producers of natural gas this interest centered on maintenance of a market for gas at a reasonable price. This price was implicitly defined by the Commissioners as a cost covering price rather than a competitive one. For the most part Olds and Draper were satisfied that the independent producers were not exploiting the consumer. Their Report indicated instead that the pipeline companies were exploiting the producers of natural gas. Olds and Draper based their conclusions with regard to independent producer control on the premise that the field markets for natural gas were buyers' markets and that the existing concentration of gas production among independent producers was either insufficient to threaten the consumers or was harmless because of the preponderant pipeline strength.[42]

Olds and Draper recommended that the Commission adopt a watchful attitude toward the field sale markets to guard against leaving this stage of the natural gas industry unguarded when and if:

> The trend toward concentration of control of gas reserves reaches a point where effective competition is destroyed and eventually monopoly prices are substituted for competitive prices.--Should

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[41] Ibid., pp. 111-20, 175-77, 459, 470-71.

[42] Olds-Draper Report, pp. 6-14, 117-36.

> such a situation develop there would appear to be no recourse but federal regulation of all sales of gas in interstate commerce.[43]

Olds and Draper, then, supported independent producer exemption from FPC control. In other matters the disagreement between these Commissioners and Smith and Wimberly were far more definite and sharp.

The Olds-Draper Report: general findings

Olds and Draper decided that the Natural Gas Act for the most part was a satisfactory instrument for regulating the natural gas industry in the public interest. No change was advocated in FPC methods of determining the value of gas in the field. More vigorous exercise of some of the other powers under the Act was, however, suggested. Gas conservation deserved more attention, and direct end use control was selected as a suitable regulatory device to attain conservation goals. Olds and Draper thought that the use of gas for such "inferior" purposes as carbon black manufacture and boiler fuel use on an interruptible basis was seriously depleting the natural gas reserves for no good purpose.[44] Greater use of coal was suggested as an alternate source of energy for those uses for which it was suited. Its relative plenty along with its geographic location made it the fuel of choice over the long run.[45] Priorities for use which would allow gas consumption only where it fulfilled special requirements not obtainable from other fuels were recommended as yielding social benefits. Gas use was acceptable to Olds and Draper where gas was decidedly cheaper counting all costs, and where the use of gas as a cheap source of fuel would bring on the industrialization of the underdeveloped producing regions of the nation, especially the Southwest.[46] Olds and Draper also advocated a concerted

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[43] Ibid., p. 13.

[44] Ibid., pp. 12-13, and passim. For definition and discussion of economic meaning of "inferior" and "superior" as used in this context see Chapter III above.

[45] Ibid., pp. 27-31.

[46] Ibid., pp. 6-13, 33-50.

effort to find and develop gas storage fields near consuming areas before their storage potential was reduced by depletion. The advantages of gas storage were that it provided cheap winter peaking service. Peak shaving in this fashion was judged preferable to either interruptible "dump" sales of natural gas for inferior uses or excessive unused line capacity during off-peak periods.[47]

Independent Producer Regulation After the Natural Gas Investigation

The conclusion of the Natural Gas Investigation left the Commissioners and the different portions of the gas industry in disagreement over appropriate regulatory policy and method. Even so, the Investigation did clear the air of some confusion and make it possible for future decisions to rest on more precise data and on more explicitly defined alternatives than had ever existed before. Unfortunately, the most significant industry change from the point of view of regulation, the great upsurge in field prices in the Southwestern field markets, had yet to occur and was not considered in the investigation. When this increase did occur, interest in regulation of the producing phase of the industry arose. Since there had been little or no consideration of the matter before, both the issues and the policy positions had to evolve through the slow process of accretion in response to day to day influences. The result of this process was an extension of effective FPC jurisdiction and a new departure in industry regulation.

The rapid increase in field prices has been described in an earlier section of this work. As stated above, the increase was a factor in bringing about producer regulation.[48] This effect is discussed below.

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[47] Ibid., pp. 9-10, 13, 85-116.

[48] Emphasis on the change in field price as the motivating factor in the regulatory changes must not cause neglect of other elements. Neither this issue nor any other is so simple as to be explained by pure economic determinism. Certainly the regulatory atmosphere, for example, as well as political and social conditions of the time contributed to regulation. Nevertheless, the rapid increase in the field price of

The Commission reaction to changes in the field markets, and more specifically to rising field prices, is of obvious importance in explaining the development over time of public policies toward producers. On a more interpretive level, indications of possible Commission reasoning and motivation are important in understanding the enforcement of the public policy which evolved, as well as in understanding the Commission views of regulation.

FPC reactions to changes in the field markets

The prewar regulatory pattern was continued after the war in most respects because most of the changes in the natural gas industry were more in degree than in kind. The increase in the interstate transportation of gas, increased number of interstate transmission companies, greater pipeline capacity and wider geographic coverage were not in themselves changes that required any alteration in the method of regulation. The rise in the field price of natural gas, however, was of a different nature. It forced a re-examination of the earlier policy which was to regulate integrated producers on a public utility basis but to exempt independent producers from FPC jurisdiction. The FPC decisions on issues were indicated formally in Commission legislative recommendations to Congress and in policy statements and Orders.

Recommendations to the Congress

The FPC was authorized by its establishing legislation to make recommendations to the Congress for legislation which would further its achievement of the purposes of the Natural Gas Act and other legislation. These recommendations, when interpreted along with other Commission actions, were a good indication of Commission evaluation of the basic regulatory problems facing it. Similarly, omission of items presented

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natural gas, along with the expectation of further increases, was the unifying and central issue in field market regulation. Had field prices not increased it is unlikely that any regulatory effort would have arisen even if the legal power of regulation were available.

before indicated a change in some variable. In an attempt to gain insight into FPC thought, the legislative requests of the agency were compiled in certain categories to facilitate examination of the FPC reaction to the rising field prices of natural gas.

There was no comment on independent producer regulation before 1955. To make this omission even more significant, the period between 1950 and 1955 exhibited a very rapid increase in field price. The Annual Report immediately following the Phillips decision (decided June 7, 1954), which covered the period July 1, 1954 to June 30, 1955, was the first in which independent producer regulation appeared as a subject of legislative recommendations.[49] The FPC had habitually sought changes in the other laws under which it operated and therefore did make such recommendations when it considered them necessary. The conclusion follows that it was the Supreme Court decision that galvanized the FPC into advocating legislative consideration of the independent producer problem. In the 1955 Annual Report the Commission expressed its approval of the Harris-Fulbright bill[50] which would have eliminated jurisdiction over the independent producer and which would have required the FPC to allow a reasonable market price to both the integrated natural gas company and to the independent producer. The Commission disapproved of a bill which would have strengthened the Phillips decision and of another bill which would have excluded certain small producers from coverage by the Act.[51]

The thinking of the FPC apparently had stabilized by the time of the writing of the 1956 Annual Report. The general position which had evolved by this time was one of reluctant acceptance of jurisdiction

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[49]Federal Power Commission, Thirty-Fifth Annual Report, 1955 (Washington: U.S. Government Printing Office, 1956), pp. 180-82.

[50]U.S. Congress, House, H.R. 4566 (Harris) 84th Cong. 1st Sess., 1955; U.S. Congress, Senate, S. 1853 (Fulbright) 84th Cong. 1st Sess., 1955.

[51]Thirty-Fifth Annual Report, pp. 176-78, 180. H.R. 4923 (Heselton) would have defined any sale for resale in interstate commerce as not being included under production and gathering, and H.R. 4924 (Heselton) would have excluded certain small producers from the Act. Senator Douglas joined in these proposed amendments (S. 1926).

over independent producers. Modification of independent producer regulation was the dominant theme of the FPC approach for the next four or five years. As a first step the Commission advocated basing independent producer regulation on something other than the usual cost of production method with its emphasis on the firm as the regulated unit. As a regulatory substitute, the FPC advocated a commodity basis without reference to cost or type of producer. In terms of goals, the FPC suggested a two-variable approach "which would enable the Commission to weigh the interest of the consumer in low prices with the necessity of providing assurance of future gas supplies."[52] The elimination of escalation clauses in gas purchase contracts was requested as an aid in protecting consumers without utility regulation of independent producers. With only very minor changes, all these 1956 recommendations appeared in the FPC annual reports for 1957, 1958, and 1959 as well.[53]

There were five significant changes in the legislative recommendations of the FPC for 1960 over those for the prior years. In 1960 the FPC abandoned its attempt to avoid or minimize jurisdiction over independent producers and moved instead to ask for administrative and other changes to make such regulation feasible. The most important of these changes was dropping the request to establish "reasonable market price" determination of transfer values for field gas. Instead the Commission requested Congress "to clarify the present authority of the Commission to fix producer rates on an area basis."[54] The price escalation clauses were attacked in the FPC appeal for Congressional "clarification" of

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[52]Federal Power Commission, Thirty-Sixth Annual Report, 1956 (Washington: U.S. Government Printing Office, 1957), p. 19.

[53]Federal Power Commission, Thirty-Seventh Annual Report, 1957 (Washington: U.S. Government Printing Office, 1958), pp. 23-26; Federal Power Commission, Thirty-Eighth Annual Report, 1958 (Washington: U.S. Government Printing Office, 1959), pp. 15-18; Federal Power Commission, Thirty-Ninth Annual Report, 1959 (Washington: U.S. Government Printing Office, 1960), pp. 18-21.

[54]Federal Power Commission, Fortieth Annual Report, 1960 (Washington: U.S. Government Printing Office, 1961), p. 17. This regulatory technique is discussed in Chapter VIII.

authority to eliminate them in new contracts and in certification procedures. FPC opposition to escalation clauses (dating from 1956) was not new, but the presumption that it had some power to act was. In 1960 the Commission took another position which in the past it had merely requested authority to take. It asked for another "clarification," this time of its authority to use a method other than the cost-of-service, rate-base method to arrive at an appropriate price for gas. Clarification rather than authorization was also requested for the proposal to ignore joint costs and joint revenues.[55]

A still greater break with the past was exhibited in the legislative requests of the FPC in the 1961 report to Congress. The Commission writing the Annual Report for 1961 was made up entirely of Kennedy appointees. Consequently, the 1961 legislative recommendations represented the judgment of the new Commissioners though the rest of the Report was a record of actions taken by Commissioners appointed under the Eisenhower administration.[56] In 1961 the most notable change from past legislative programs was not in new powers requested, but rather in powers not requested. The new Commission simply assumed that the powers desired were available under existing legislation. This implied that only excessive timidity or misinterpretation of the law had prevented them from being exercised in the past. The new FPC Commissioners took the regulatory initiative from Congress. This put Congress in the position of either ratifying by inaction any changes the FPC made or else acting to overrule the direction in which the Commission was taking regulatory policy. In the absence of Congressional action, the Courts stood as the ultimate judge of the legal status of the FPC position.

No references to independent producers were to be found in the 1961 report. Requests for authorization to raise rates to prevent discrimination and to allocate gas in time of shortage were also eliminated. There were two changes from 1960 requesting extended authority, the

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[55] Ibid., pp. 17-19.

[56] Federal Power Commission, Forty-First Annual Report, 1961 (Washington: U.S. Government Printing Office, 1962), p. 1.

first renewing the earlier request for jurisdiction over direct sales for industrial use only and the second changing the request "to be allowed to authorize emergency interconnections" to the more forceful "authority to require" such interconnections.[57]

Some conclusions can be drawn about the course of FPC reaction to regulation of independent gas producers during the 1954-1961 period from the above review. The FPC did not seek jurisdiction in the years before the Phillips decision, and with varying amounts of vigor it attempted to have the existing jurisdiction removed by the Congress after 1954. The request to allow "reasonable market prices" to determine regulation was not abandoned until 1960, and the new Commission taking office in 1961 was the first to feel that it could act adequately without further legislation. The year 1960 was crucial as one of transition, with the area-pricing formula adopted and with the move toward seeking Congressional review, rather than Congressional initiation, in getting producer regulation off the ground.

Producer regulation and the consumer interest

The FPC reaction to the field market changes between 1950 and 1960 was consistent with the expected reaction given a pervasive public utility image of appropriate regulation.[58] The attempt to carry over to the regulation of natural gas production methods designed for the regulation of quasi-"natural monopolies" added justification to the desire to avoid jurisdiction over independent producers. In this context there were three reasons why the Commission did not press for regulation of the natural gas production industry. The first of these was that the Commission assumed that competition existed in the field

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[57] Ibid., p. 2.

[58] The motives and reasoning behind the FPC reaction--or lack of reaction--to field market jurisdiction can only be inferred from the actions taken, and the inferences made are not subject to either proof or disproof. The inferences drawn in this section were based on the assumption that in the face of given field market conditions the FPC was acting in the total consumer interest.

markets, and that its bare existence, as defined by number of sellers and the absence of collusion, made regulation both unnecessary and unwise. The second was that though the field market conditions were perhaps not such as to maximize welfare, the tools of regulation available--the cost of service or rate-base method--were not such as to enable the Commission to make better decisions. The final possible explanation was that the FPC perceived the tasks of regulation of natural gas production by independent producers as beyond the abilities of the Commission, since the public-utility approach required individual cost and revenue studies of the multitude of individual producers.

Competitive nature of the industry

Traditional public-utility regulation rested on the presumption that the public interest was not served due to the lack of competition. The presence of competition, however, was assumed to result in appropriate allocation of resources among competing uses and hence maximum economic welfare measured by private decisions. Interference in the allocative process under these assumptions resulted in a lessening of welfare because the optimal consumer decisions would be altered. The generally competitive structure of the production phase of industry was dealt with above in Chapter IV.

A competitive structure in the field market was consistent with the rising field prices. In so far as those rising field prices were brought on by the increasing expense of obtaining natural gas supplies they were necessary to the provision of the natural gas to the ultimate consumers. The rise in the field price of natural gas which resulted in increased rental payments to the holders of gas reserves was also necessary if the limited gas supplies were to be allocated among potential users. Given underlying conditions, if the price of gas did not rise there would be unsatisfied potential purchasers of gas and rationing on some basis other than price would be necessary. The only way, in this view, of assuring that the gas would go to its most valued use would be to allow price to rise to a point where the amount supplied was just taken off the market by the consumers.

If competition were thought to be present in the field markets, under the public-utility rationale the FPC rejection of regulation of the natural gas production industry was consistent with its efforts to protect consumers from exploitation and promote the aims of the Natural Gas Act. This interpretation of the role of competition was predicated, of course, on the assumption that free market operation resulted in maximum social benefit, which in turn required acceptance of the desirability of laissez faire and a belief that it was applicable to the natural gas industry. The review of the economics of natural gas production in Chapter II pointed out that in some relevant particulars the industry differed from the model encountered in economic theory. The existence of the appearance of competition in the field market, however, lent justification to FPC inaction in producer regulation.

Scope of the regulatory concept

The second plausible reason for FPC rejection of field market regulation was that the appropriate industry regulation was necessarily beyond the scope of the prevailing cost of service, rate-base method. All price regulation (as contrasted to certification procedures) by the FPC followed a formula designed to relate price to cost to prevent exploitation of the consumer. Specified service conditions were imposed only to prevent those with market power from doing by indirection what they were prevented from doing openly. By its essence public utility type regulation was capable only of adjusting the interests of two parties--the purchasers and the sellers. These adjustments were possible only over a limited range of variables, which did not include some of the important issues of regulation. End-use control, the appropriate use rate of gas over time, and the geographical claims on the natural gas supply were among the issues which the traditional regulatory methods were conceptually unable to resolve. Public utility regulation would, despite the lack of intent, affect these and other variables. Such effects would be unintended but inevitable by-products, not entering as considerations at the decision level. Conservative regulation would avoid bringing alterations which were not the intended by-product of

direct action. Consequently, because of the limited scope of regulation the FPC might have felt the wiser course to be no regulation at all. Actually the welfare result from lack of action bore no assurance of superiority over the results from regulation, whatever the basis chosen. Its seemingly impersonal operation, however, freed individuals from obvious responsibility.

Enormity of regulatory task

One final factor might well have caused the FPC to avoid jurisdiction over the independent producer of natural gas. The job was just too big for effective accomplishment under the accepted regulatory method. The number of independent producers was in the thousands while the number of transporters of natural gas in interstate commerce, the firms the FPC was equipped to handle, was closer to 100. Given the number of producers, cost-of-service and investment studies of each firm on the usual basis required more resources than the FPC thought would be available. Even the regulatory minimum of accepting filed reports, verifying them, and granting production certificates would have overburdened the FPC facilities. The alternative of limited regulation of producers was inconsistent with FPC experience or with the public utility concept under which it functioned.

Regulation of spacially oriented monopolies requires total coverage by the regulatory agency if protection from exploitation is to accrue to all consumers. Since the only alternative consumers have is to move, an unregulated firm, no matter how small or limited geographically, has just about as much exploitative potential as the largest. In the natural gas production industry there was no spacial monopoly, and if market power of any sort existed it was far from absolute. Two implications flowed from this difference between the production and transportation phases of the industry. First, as noted above, the regulation of production was incapable of being justified on the same grounds as were used for justifying the regulation of transportation. Analogously, if regulation were adopted the type of regulation required would also be different. If individual gas supply markets were either not

monopolized or not isolated, then alternatives were open to buyers. If buyers were mobile, then control over one portion of the industry would generate effects which would be transmitted to the rest of the industry. The leverage exerted through control over big producer contracts, for example, could act on small producers as well by forcing the unregulated producers to meet the terms offered by the regulated producers if they were to retain a market for their gas. While the result might not be uniform, effective regulation could result from jurisdiction over a manageable number of independent producers. The regulation of the natural gas production industry, to the extent that it was rejected on the grounds that the burden would overtax the available regulatory resources, was based on a model which in certain important respects did not coincide with the regulatory context which existed.[59]

As the above three arguments have demonstrated, the FPC rejection of jurisdiction over independent producers was consistent with a consumer oriented view of the regulatory scene during the 1950-1960 decade. Whether the FPC was or was not motivated by these arguments throughout the period is not subject to verification. The possibilities presented by them, however, preclude the easy conclusion that the FPC was unmindful of consumer interests in allowing the rapid increase in the field price of natural gas without action on its part.

Legal Development of FPC Jurisdiction Over Field Sales

FPC jurisdiction over the field sales of natural gas for resale interstate was established in a series of court decisions which spanned the postwar period. Whatever the FPC position as to the wisdom or the practicality of regulation of the field sales contract, the legal obligation to effect that regulation became inescapable under the law.

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[59]The discussion here has abstracted from certain practical considerations which quite possibly would require full independent producer coverage. The point made, however, is that the nature of the FPC experience was such that this alternative was rejected in the 1950-1960 period for other reasons.

This obligation was a result of judicial interpretation of the Natural Gas Act. While many cases settled minor regulatory issues, the Phillips case of 1954 and three others were the most important in establishing the jurisdictional framework which existed at the end of 1962. These cases are discussed below because of the insight provided by them on the evolution of field sales regulation. The discussion of each is limited to issues which have a direct effect on field regulation. The legal decisions are considered within the regulatory framework. No attempt is made to report the cases in a balanced or thorough manner. The Phillips case, for obvious reasons, is discussed at somewhat greater length. Dissenting positions are given where pertinent.

The Colorado Interstate Case

The Colorado Interstate case involved three main points: first, whether the Commission had to separate the properties used for jurisdictional sales from those used for nonjurisdictional sales or whether it could merely allocate costs between them; second, whether the interstate sales for resale for industrial uses were to be regulated under the Act; and finally, whether the production and gathering exclusion prevented the Commission from taking production properties into account in its regulatory activity. Overriding all these concerns was the further question of the method of regulation. This last question made the Colorado Interstate case important in the development of regulation of integrated producers.

With reference to FPC jurisdiction, the most important finding in the Colorado Interstate case was that production and gathering activities and properties were not to be regulated directly by the FPC. This judgment was to be interpreted narrowly, however, because the exclusion clause did not restrict FPC jurisdiction solely to matters which would not influence production and gathering. Any incidental effects of regulation of sales for resale were not deemed sufficient grounds for invoking the production and gathering exclusion. A portion of the decision more precisely delimited this thinking:

> . . . That provision [production and gathering exclusion] precludes the Commission from any control over the activity of producing or gathering natural gas. For example, it makes plain that the Commission has no control over the drilling and spacing of wells and the like. It may or may not put other limitations on the Commission. We only decide that it does not preclude the Commission from reflecting the production and gathering facilities of a natural gas company in the rate base and determining the expenses incident thereto for the purposes of determining the reasonableness of rates subject to its jurisdiction.
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> That treatment of producing properties and gathering facilities has of course an indirect effect on them. As we have said, rate-making like other forms of price fixing may reduce the value of the property which is being regulated. [Hope, 320 U.S. 591, 601 (1944)][60]

The Court held, explicitly following reasoning from the Hope case, that the Act established the necessity for regulating the interstate sales of natural gas for resale, and this required some determination of the price of gas as it entered the pipelines of regulated companies. It stated further that the Congress had not established a method of regulating the cost of gas, though it could have done so had it chosen. Hence the Colorado Interstate decision left the production and gathering activities and facilities under state control but provided the FPC with authority to regulate transfer price between the field and the interstate transmission phases of the industry. Such regulation necessitated direct consideration of production and gathering costs--which consideration was specifically approved here only with reference to integrated producers. In this manner the Court approved in part the position advanced by Commissioner Scott in his minority opinion in the Columbian case.[61]

The Interstate Case

The second case leading to further definition of the problem of the regulation of the independent producer of natural gas was Interstate

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[60] 324 U.S. 581, 603. See above, Chapter III, for a discussion of integrated producer regulation as influenced by the Colorado Interstate decision.

[61] 2 F. P. C. 200, 212-213.

Natural Gas Co. v. Federal Power Commission which was decided June 16, 1947.[62] The question at law in this case was whether the production and gathering exclusion applied to a company which did some producing and gathering but which also purchased gas from other producers and then, after mingling all the gas, transported it across state boundaries for eventual resale. The contention of the company that the sales were not in interstate commerce was immediately rejected. In an earlier action even Interstate had successfully argued that its operations were in interstate commerce and therefore beyond the reach of state control.[63]

Filling the gap in gas regulation created by the Attleboro and Missouri v. Kansas Natural Gas Co. cases[64] was accepted by the Supreme Court as one of the purposes of the Natural Gas Act. The Act filled this gap, according to the decision, and the production and gathering exclusion was to reserve to the states only those powers that the states were legally competent to administer. The Court held that if the jurisdiction of the FPC interfered with the lawful exercise of state power, jurisdiction would not follow. It restricted this limitation, however, by stating that the interference must be clear and the conflict obvious --the production and gathering exclusion was to be strictly construed.[65] In its closing statement on the case the Court looked to the effect of the operations of Interstate. It said that the sales were in interstate commerce.

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[62] Interstate Natural Gas Co. v. Federal Power Commission, 331 U.S. 682 (1947). (Hereinafter referred to as Interstate.) Investigation begun by FPC by an order of December 5, 1939. Opinion of FPC reported in In the Matter of Interstate Natural Gas Company, 3 F. P. C. 416 (1943).

[63] Ibid., p. 687. Reference is made to Interstate Natural Gas Co. v. Public Service Commission, 33 F. Supp. 50; 34 F. Supp. 980 (D.C. La. 1940).

[64] 273 U.S. 83; 265 U.S. 298.

[65] Interstate, pp. 689-691.

> It cannot be doubted that their regulation is predominantly a matter of national as contrasted to local concern. . . . Unreasonable charges exacted at this stage of the interstate movement become perpetuated in large part in fixed items of costs which must be covered by rates charged subsequent purchasers of the gas, including the ultimate consumer. It was to avoid such situations that the Natural Gas Act was passed.[66]

The immediate reaction to the Interstate decision was one of great concern among the independent producers because they felt that the Interstate case gave a precedent for their own regulation. Legal interpretations bore out this expectation. Commenting in the context of the Interstate decision, Marshall Newcombe, an expert on gas law, wrote that sales of natural gas at the well were sales in interstate commerce if destined for interstate markets, no matter what the contractual relationship involved. He also said that the production and gathering exemption would be strictly construed and that it would be limited to physical matters and to such local concerns as conservation. Sale for resale in interstate commerce would not fall under this exclusion. The statement that sale for resale was a matter of national concern, rather than local, was reinforcement sufficient to remove all doubt on this point. Finally, and more specifically, Newcombe said:

> The FPC may regulate any purchase or sale of gas which affects or enters into the ultimate rate charged by a natural gas company for gas which it sells for resale in interstate commerce. This includes the authority to regulate the price at the point of production or gathering, and such regulation is valid even though local interests (state interests) may in some degree be affected.[67]

Donald C. McCreery, writing in the Mississippi Law Journal, came to essentially the same conclusion. He said that as a result of this decision the Congress in delegating authority over interstate commerce delegated authority over all activities "leading to," "affecting," or

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[66] Ibid., pp. 692-693.

[67] Marshall Newcombe, "Federal and State Regulation of Gas Utilities," First Annual Institute on Oil and Gas Law and Taxation (Dallas: Southwestern Legal Foundation, 1949), p. 124.

"relating to" the "flow," "stream," or "current of" that commerce. He wrote that this interpretation prevented the Congress from establishing boundaries of jurisdiction in expressing its legislative discretion. McCreery disagreed with the Supreme Court interpretation which he said provided for an unwarranted expansion of all authority granted by the Congress. The effect of the Court's interpretation, he said, was clearly to place independent producers under FPC control.[68]

The Phillips Case

The Phillips case began October 28, 1948. In an order instituting the investigation which led to the Court decision the FPC said that it was necessary to determine whether the Phillips Company was a natural gas company within the meaning of the Natural Gas Act and, if so, whether its charges were unfair or discriminatory. If the answers to the first two questions were positive, it would be necessary to establish proper charges for the Phillips operations. The City of Detroit actually set the wheels of the investigation in motion when it requested that Phillips, as the producer and gatherer of the natural gas involved, be made a part in the proceedings entitled In the Matter of Michigan-Wisconsin Pipe Line Co.[69] The decision was to open a new investigation to make the above determinations.[70]

The Commission decision

Hearings and investigations continued in Docket G-1148, the Phillips investigation, and the others which were joined with it until August 16, 1951, when the decision was announced. The Commission held that because of the production and gathering exclusion the Phillips

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[68]Donald C. McCreery, "The Legal Consequences of the Interstate Natural Gas Company Decision and Related Cases," 19 Mississippi Law Journal, 153 (1948).

[69]In the Matter of Michigan-Wisconsin Pipe Line Co., 6 F. P. C. 1 (1947).

[70]In the Matter of Phillips Petroleum Co., 7 F. P. C. 938 (1948).

Company was not a natural gas company under the law, and that a consideration of the rates charged by Phillips in its operations was therefore not appropriate.[71] The decision was purportedly based on the Supreme Court interpretation that the statute excluded jurisdiction over "incidents connected with" and "activity related to production and gathering." Phillips operations were found to fall within these limits because they were either part of the gathering process or so closely related to it so as to fall within the "incidents to" exemption.[72]

The FPC staff position in the case was that the gathering operations of the company were completed before some of the sales were made and that the company was therefore under the jurisdiction of the Commission because it transported gas interstate. Intervenors from consuming states argued that Phillips' sales were sales for resale in interstate commerce and therefore should be regulated for the same reasons that the "sales" of gas produced to their own account by pipeline companies were regulated. To these intervenors the timing of the sales was not an issue capable of removing Phillips from FPC jurisdiction.[73]

The interpretation of the production and gathering exclusion as involving physical activity and facilities alone was accepted by the Commission, following the reasoning of Colorado Interstate. The Commission argued that the Colorado Interstate case, if it were holding, would justify regulation of Phillips. The Interstate case was also cited as affecting the interstate commerce question. This ruling left the production and gathering exemption to be strictly construed and only applicable when there was a direct and stringent conflict with state regulation. Here, according to the Commission, the Court could have made a clear demarcation, leaving local control where it was not unconstitutional and giving national jurisdiction to the FPC. The Commission

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[71] In the Matter of Phillips Petroleum Company, Proceeding to Determine Whether Phillips Petroleum Company Is a "Natural Gas Company" as Defined by The Natural Gas Act, 10 F. P. C. 246, 283 (1951).

[72] Ibid., pp. 276-278.

[73] Ibid., p. 251.

held that the Court did not choose to use those grounds for its Interstate decision. It relied, instead, according to the Commission, on the fact that the gathering process was complete before the sales for resale took place.[74]

The Commission did not find the Colorado Interstate and Interstate cases persuasive. The Commission chose to rely instead on its interpretation of the decisions in other litigation. In Federal Power Commission v. Panhandle Eastern Pipe Line Co., the FPC was denied authority to prevent Panhandle Eastern from disposing of some of its producing properties.[75] The Court interpreted the production and gathering exclusion in this case as limiting the FPC jurisdiction over physical properties. The Commission saw in this case a model more in keeping with the Phillips facts, and saw this decision as being partially inconsistent with Colorado Interstate and Interstate.[76] The Commission also relied on precedents established in litigation over state established floors under gas prices at the well to bolster its decision that the independent producer was beyond regulation. In Cities Service Gas Co. v. Peerless Oil and Gas Co. the Supreme Court upheld the right of the states to make and enforce such regulations.[77] The Commission argued that if the state had the legal right to regulate the wellhead price of natural gas, FPC regulation of the same matter would constitute a significant interference with state operations and therefore the FPC action would fall under the most strict interpretation of the Interstate decision.[78]

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[74] Ibid., pp. 271-273. [75] 337 U.S. 498.

[76] Phillips, 10 F. P. C. 246, 273. Quoting from and referring to Panhandle Eastern, 337 U.S. 498, 505-506, 512-513. The point that both the Colorado Interstate and the Interstate decisions denied FPC jurisdiction over physical property, but allowed jurisdiction over sales for resale and property valuation was ignored. Thus the three cases were consistent, and consistent on the issue relevant to the Phillips hearing, namely FPC jurisdiction existed over commercial transactions despite any influence those transactions had on operations.

[77] 340 U.S. 179. See above, Chapter II.

[78] Phillips, 10 F. P. C. 246, 274-276.

In statements not bearing directly on the outcome of the issues before it, the FPC majority pointed out protections remaining to consumers even in the absence of control over prices charged by independent producers. The representatives of consumer interests were urged to appeal the FPC decision to bring the matter to decision at the highest level through the judicial process. The majority also noted that disagreement with the decision and concern over consumer exploitation would find its appropriate remedy in the Congress, and not in an expansion of the Natural Gas Act beyond the Commission's interpretation of its statutory scope.[79]

The minority view

Two Commissioners disagreed in part with the Commission decision. Draper concurred with the outcome of the case but felt that it should have been based on different grounds. The production and gathering exemption was not enough, in his view, to eliminate FPC jurisdiction over an independent producer such as Phillips. Interference with state regulation would result from FPC regulation of independent producers, however, and this fact alone was to him justification for limiting FPC jurisdiction.[80]

Commissioner Buchanan dissented in a long opinion which emphasized exhaustive analysis of all facets of the case. This dissent rested on the argument that the majority decision nullified the Congressional intent to close the regulatory gap opened by the Attleboro and Missouri v. Kansas Natural Gas Company decisions. While for Phillips the production and gathering processes were completed before the sales in interstate commerce took place, this condition was simply an unnecessary addition to the basic justification for regulation. The Interstate decision clearly established the precedent for regulation of the sales for resale even at the production and gathering level, according to Buchanan.[81]

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[79] Ibid., pp. 277-283.

[80] Ibid., pp. 283-284.

[81] Ibid., pp. 284-299.

Buchanan stated that the conflict between state and national regulation, on which the majority relied so heavily, did not exist.

> Surmise, conjecture, or speculation concerning possible future conflict provides no basis for denying jurisdiction under the Natural Gas Act.
>
> . . . . . .
>
> The evidence overwhelmingly demonstrates the absence of any known conflict or interference by the FPC with the activities and regulation by these State agencies during a period of 13 years. The states have conducted their conservation activities with no known conflict between the two jurisdictions.[82]

Buchanan concluded his dissent with a review of the different ways the Commission had interpreted the production and gathering exclusion. He pointed out that in the Columbian decision the Commission held that it was not authorized to regulate field sales. The Commission in the Peoples Natural Gas Company case, with facts very similar to Columbian, took a very different position though the issues in contention were not different. The Peoples Company divested itself of the disputed business and the proceedings were dropped.[83] The position of the FPC on the Interstate matter was noted above.

Buchanan charged that the majority decision in the Interstate case, when coupled with the sustaining ruling by the Court of Appeals, brought forth such a storm of protest and political pressure that the FPC attempted to hedge when it argued the case before the Supreme Court. To forestall the critics of independent producer regulation the FPC tried to distinguish between the Interstate company and independent producers in such a way as to leave Interstate within, and the independent producers without, the range of FPC authority. Buchanan charged that in addition the FPC hastily decided some independent producer cases to establish a precedent for the tack it took before the Supreme Court and

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[82] Ibid., pp. 301, 305.

[83] Peoples Natural Gas Co. v. Federal Power Commission, 127 F. 2d 153 (C.A.D.C. 1942). The Circuit Court of Appeals for the District of Columbia upheld the Commission and the District Court on this matter. Cited in 10 F. P. C. 246, 309.

to reassure and thereby quiet the producing interests and states.[84] Despite these moves, the Supreme Court affirmed the lower court decision and left the FPC with jurisdiction over production and gathering. Even in the face of these facts the Commission followed the Interstate decision with the issuance of Order 139 which disclaimed jurisdiction over sales by independent producers.[85] According to Buchanan, Order 139 directly repudiated the Interstate decision, and moreover, by its nature was a nullity.[86] Then, despite the issuance of Order 139, the Commission initiated the investigation of the Phillips Company on October 28, 1948.

In April, 1949, Buchanan pointed out, the Commission reversed itself again. Three Commissioners testified before the Congress on bills to restrict jurisdiction of the FPC. These Commissioners took the position that because of the Interstate decision the FPC had authority to regulate the independent producers, and that this authority was necessary to protect the consumers from exploitation at the hands of the independent producers. When the Congress, in March, 1950, passed the Lyle-Harris bill over the objections of a majority of the Commission, that same majority favored a veto by the President. President Truman vetoed the bill April 15, 1950. The Commission then issued Order 154 on July 11, 1950. Order 154 rescinded Order 139 and set the policy that there would be no general investigation of producer rates but that any rates which appeared excessive would be examined by the Commission. The Commission's Phillips decision went directly contrary to Order No. 154, Buchanan wrote. Prior to the Phillips decision, as this short summary by Buchanan pointed out, the FPC had held almost every conceivable position on the question of the jurisdiction over the independent producer under the Natural Gas Act.[87]

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[84] 10 F. P. C. 246, 309-310.

[85] 6 F. P. C. 835-838. Order 139, as it is referred to in Commission proceedings, was apparently published as separate orders in three cases involving the Hunt gas holdings. Hassie Hunt Trust (Docket No. G-925); H. L. Hunt (Docket No. G-926); H. L. Hunt (Docket No. G-927).

[86] 10 F. P. C. 246, 310-311.

[87] Ibid., pp. 311-313.

The Phillips case on appeal

The Phillips decision by the FPC was appealed by the consumer representatives, and the case was carried forward by the Public Service Commission of Wisconsin which had initiated the first proceedings. The case went first to the Circuit Court of Appeals of the District of Columbia and the FPC was reversed.[88] Upon appeal, Certorari was first denied and then granted by the Supreme Court (346 U.S. 934, 935) and the Circuit Court decision was affirmed June 7, 1954.[89] Justice Minton delivered the opinion of the Court, with Justice Frankfurter concurring in a separate opinion and Justices Douglas and Clark writing separate dissents. Justice Burton concurred with the dissent offered by Justice Clark. Justice Jackson took no part in the proceedings.

Majority opinion

The reasoning by which the Court affirmed the decision of the Circuit Court of Appeals need not be discussed at length since the arguments basically were those used in earlier decisions referred to above. Three points were made by the Court: a) Phillips was engaged in interstate commerce, b) the production and gathering exclusion [sec 1(b) of the statute] did not exclude jurisdiction because sales for resale were commercial transactions and not part of the production and gathering process, and finally, c) Congressional intent was to fill the regulatory gap and the Natural Gas Act did so, conferring jurisdiction over all sales for resale, whether before, during, or after production and gathering operations.

The first of these points, that Phillips was engaged in interstate commerce, was all but obvious. This position was accepted by Phillips and by the FPC.[90] For the second question the Court referred back to its decisions in the Colorado Interstate, Panhandle Eastern, and Interstate cases in deciding whether the production and gathering

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[88] Wisconsin v. Phillips Petroleum Company, 205 F. 2d 706 (C.A.D.C. 1953).

[89] 347 U.S. 672.

[90] Ibid., p. 677.

exclusion limited jurisdiction to integrated producers.[91] In these cases, as in others, a distinction was made between regulation of production and gathering with reference to facilities and operating methods, which was left to the states, and sales for resale which had a national effect. The Interstate case, moreover, provided a test of the potential conflicts between state and federal jurisdiction when the decision held that any conflict must be clear, present, and immediate before the question of jurisdictional conflict would arise. As the Court stated, when refusing to grant the distinctions which Phillips and the FPC tried to make between Interstate and Phillips, "This Court, however, refused to rely on such refinements and instead based its decision in Interstate on the broader ground that sales in interstate commerce for resale by producers to interstate pipeline companies do not come within the 'production or gathering' exemption."[92] In emphasizing that the Phillips decision was no new interpretation for the Court, the decision read in part: "We see no reason to depart from our previous decisions, especially since they are consistent with the language and legislative history of the Natural Gas Act."[93]

The last point made by the Court was in a line which stretched back, at least as a minority opinion, to the dissent filed by Commissioner Scott in the Columbian case. Congressional intent, according to the Court, was to fill the regulatory gap in order to protect the consumer from exploitation. Quoting from the last paragraph of the opinion,

> Regulation of the sales in interstate commerce for resale made by a so-called independent natural-gas producer is not essentially different from regulation of such sales when made by an affiliate of an interstate pipeline company. In both cases the rates charged may have a direct and substantial effect on the price paid by the ultimate consumers. Protection of consumers against exploitation at the hands of natural-gas companies was the primary aim of the Natural Gas Act. Federal Power Commission v. Hope Natural Gas Co., [320 U.S. 591, 610] Attempts to weaken this protection by amendatory legislation exempting independent natural

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[91] 324 U.S. 581; 337 U.S. 498; and 331 U.S. 682, respectively.

[92] 347 U.S. 672, 681. [93] Ibid.

> gas producers from federal regulation have repeatedly failed, and we refuse to achieve the same result by a strained interpretation of the existing statutory language.[94]

Minority opinions

There were three dissenting Justices in the Phillips decision, and since Justice Jackson took no part in the case the decision was split 5--3, with one of the majority writing a separate concurring opinion. The grounds given for the dissents, like the arguments of the majority opinion, were not original. Justice Douglas implied that regulation perhaps should cover the natural gas production industry but he thought that the production and gathering exclusion removed the independent producer from regulation. He found that the record of the FPC had been consistent in never regulating the independent producer. Further, apparent Congressional intent, the history of the FPC operations in the industry, and the weight of legal opinion pointed to the conclusion that jurisdiction should be withheld unless Congress granted it explicitly. Justice Douglas expected regulation of sales for resale by independent producers to bring all their operations under control. He said that the effects of this action were too great to be undertaken by the Court, which, after all, had limited knowledge of the results that would flow from such a decision. "Regulation of the business of producing and gathering natural gas involves considerations of which we know little and with which we are not competent to deal."[95]

Justice Clark held in his separate dissent that the regulation of the independent producer was withheld from the FPC by the production and gathering exclusion. Phillips, according to Clark, operated only on the production and gathering level of the natural gas industry, and therefore should not be regulated by the FPC. Such regulation, he wrote, "acts contrary to the intention of Congress, the understanding of the states, and that of the Federal Power Commission itself."[96] National

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[94] Ibid., 685.

[95] Ibid., p. 690. Justice Douglas' dissent is found on pp. 687-690.

[96] Ibid., p. 671. Justice Clark's dissent is found on pp. 690-698.

regulation of sales for resale would interfere with the exercise of state responsibility for conservation regulation. In terms of the proposition that the Natural Gas Act was written to fill the regulatory gap, Justice Clark agreed but interpreted the "gap" quite strictly. The "gap", according to Clark, was that expressly opened by the Missouri v. Kansas Natural Gas Co. and Attleboro cases.[97] Since production and gathering by independent producers had not been mentioned in these cases, Clark held that these functions were not part of the gap that was to be filled. Moreover, the FTC, in its reports which provided the issues and data which gave rise to the Natural Gas Act, did not find that the independent producers were exercising abusive pricing methods.[98]

Clark disagreed with the interpretation of the phrase "production and gathering" as relating only to physical activities, facilities, and properties. He said on this point:

> If the Congress so intended, then it left for state regulation only a mass of empty pipe, vacant processing plants and thousands of hollow wells with scarecrow derricks, monuments to this new extension of federal power. It was not so understood. The states have been for over 35 years and are now enforcing regulatory laws covering production and gathering, including pricing, proration of gas, ratable taking, unitization of fields, processing of casing-head gas including priority over other gases, well spacing, repressuring, abandonment of wells, marginal area development, and other devices. Everyone is fully aware of the direct relationship of price and conservation. Federal Power Commission v. Panhandle Eastern Pipe Line Co. [337 U.S. 498 at 507] And the power of the states to regulate the producers' and gatherers' prices has been upheld in this Court. . . . We cannot square this result with the House Report on this Act which states that the subsequently enacted bill "is so drawn as to complement and in no manner usurp State regulatory authority." H. R. Rep. No. 709 [75th Cong., 1st Sess., p. 2].[99]

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[97] 265 U.S. 298; 273 U.S. 83, respectively.

[98] As noted in Chapter III above, the economic conditions in the gas field markets were such as to make the absence of citations to abusive pricing practices by consumers not surprising. Whether the "gap" to be filled was defined by the conditions of the time of the Act or by the situation as the passage of time brought new conditions was a matter of judicial determination. The Court majority favored a loose interpretation of the Act.

[99] Phillips, 347 U.S. 672, 683-684.

In his dissent Justice Clark also distinguished the Phillips operations from those of Interstate and pointed out that the Interstate decision was therefore not binding on the Court in the case of an independent producer. Interstate was a middleman, Clark said, and it had avoided state regulation. No possibility of regulatory conflict arose. In addition, the Court in the Interstate opinion explicitly denied that its decision had any effect on Columbian and Billings. Since there was no essential difference between the operations of Columbian and those of Phillips, the finding that jurisdiction accrued to Interstate could not serve as a precedent for regulating Phillips.[100]

The Deep South Case and Others

The Supreme Court decision in the Phillips case removed all doubt as to whether, under the Natural Gas Act, jurisdiction existed over the large producers and gatherers of natural gas destined for interstate sale. Some of the producers thought, however, that the finding was based on the large size of Phillips operations and on the fact that Phillips owned gathering lines which could be viewed as transporting gas. Two particular circumstances were viewed by some members of the industry as providing a barrier to federal regulation. The first of these involved the small producer who made his sales at the wellhead before any gathering or processing of the gas had taken place. The second was the matter of jurisdiction over casinghead gas, produced along with state regulated crude oil. In the fall of 1954 a group of producers asked for an order removing the uncertainty about their status under the Natural Gas Act. The producer petitions were accepted and several were joined for a common hearing which began January 10, 1955. The presiding examiner filed the intermediate decision April 15, 1955.[101] The full Commission rendered

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[100] Ibid., pp. 696-698.

[101] In the Matters of Deep South Oil Company of Texas, Humble Oil and Refining Company, Shell Oil Company, 14 F. P. C. 309 (1955). Edward B. Marsh, Presiding Examiner. (All proceedings on this issue hereinafter referred to collectively as Deep South.)

its decision affirming the examiner's decision on September 9, 1955.[102] The two proceedings are discussed jointly below.

The finding of the presiding examiner was that all production and sales of gas of which even a portion entered interstate commerce were under the jurisdiction of the Federal Power Commission:

> The Supreme Court made it crystal clear that the over-riding consideration motivating Congress in the passage of the Act was the protection of gas consumers from exploitation. Construing the provisions of the Natural Gas Act so as to protect the ultimate consumer of natural gas from exploitation as contemplated by Congress and for that purpose to fill the "gas" [sic] between state and Federal regulation, it must be concluded that no conceivably useful purpose would be served by determining a point at which, under other circumstances and for other purposes 'production' and 'manufacturing' might end. 'Interstate commerce' as the term is used in the Act is, at least, coextensive with the 'gap' to which the Court referred.[103]

In affirming the opinion of the presiding examiner the Commission made eight general points which are of interest as a summary definition of the limits of FPC jurisdiction. With this affirmation, and its judicial acceptance, federal control was extended to the wellhead, or beyond, for any gas sold for resale in interstate commerce or commingled with that which was so sold. The eight points are summarized below:

1. Casinghead gas is natural gas.
2. A sale of natural gas before completion of production and gathering does not bring that gas under the section 1 (b) exemption.
3. Processing of gas does not interrupt the interstate flow or continuous movement.
4. Jurisdiction holds where only a portion of the gas produced goes interstate, and that, as a part of a commingled mass.
5. Lack of producer control over the destination of the gas does not relieve the producer of jurisdiction because it does not influence whether or not the sales are in interstate commerce.

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[102] In the Matters of Deep South Oil Company of Texas, Humble Oil and Refining Company, Shell Oil Company, 14 F. P. C. 83 (1955).

[103] Deep South, 14 F. P. C. 309, 331-332.

6. The intent of the producer does not affect the nature of the sale since it is the facts of the sale and not intent which is ruling.
7. Sale to an intermediary which in turn sells in interstate commerce leaves the producer in interstate commerce if such sales are made.
8. The degree of state regulation or state opposition to federal regulation has no effect over federal jurisdiction.[104]

The Commission decision was appealed to the Court of Appeals of the Fifth Circuit. This Court, in a two to one decision, affirmed all the decisions of the FPC in the individual cases which were brought before it.[105] Humble and Shell both carried an appeal to the Supreme Court. Certiorari was denied in both instances and there the issue of producer regulation was finally put to rest.[106] No longer could the issue of the jurisdiction of the FPC be raised with reference to independent producers with any hope of establishing a legal defense against regulation.

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[104] Deep South, 14 F. P. C. 83, 84-91.

[105] There were four cases appealed to the 5th Circuit Court of Appeals. All cases were argued concurrently. A decision was written with particular reference to Deep South. Other cases took up individual points while referring to Deep South for the basic decision. The cases were: Deep South Oil Co. v. Federal Power Commission, 247 F. 2d 882 (5th Cir., 1957); Shell Oil Co. v. Federal Power Commission, 247 F. 2d 900 (5th Cir., 1957); Humble Oil and Refining Company v. Federal Power Commission, 247 F. 2d 903 (5th Cir., 1957); Continental Oil Company v. Federal Power Commission, 247 F. 2d 904 (5th Cir., 1957).

Another case involving essentially the same facts was decided a short time later in another jurisdiction. This other case provided a concurrent decision which, had it gone against the other cases, would have required a Supreme Court hearing. This was: Saturn Oil and Gas Company v. Federal Power Commission, 250 F. 2d 61 (10th Cir., 1957).

[106] Certiorari was denied in Shell Oil Company v. Federal Power Commission, 355 U.S. 930 (1958); and Humble Oil and Refining Co. v. Federal Power Commission, 355 U.S. 930 (1958).

CHAPTER VI

GOALS OF REGULATORY POLICY

The goals of regulatory policy accepted for the purposes of evaluating various alternative regulatory patterns in the natural gas production industry were discussed in Chapter I. At that point the reasons for selecting these goals were discussed. The first of these guidelines for regulatory policy centered on individual welfare maximization, emphasizing the goal of maximum efficiency in the allocation of resources. The broader question of maximum total personal satisfactions was ignored. The second goal selected was establishment of the appropriate sector distribution of income through intervention in the industry. Changing the allocation of resources over time (and perhaps coincidentally the distribution of income) because of social or national interests which differed from individual interests as expressed through market operations was the final value considered.

Other goals could have been chosen, or other content than that which follows could have been placed within these goals. The elements of public policy selected, however, were chosen on the basis of their usefulness in organizing the experience of the FPC in gas regulation and because they seemed to coincide with accepted public policy postulates in the United States at this time. The discussion relating to these goals can with some degree of success be shifted to other possible value choices and the interpretations given will be of some value.

Maximum Welfare

Maximum welfare as a determinable condition was discussed in Chapter I. At that point this criterion was related to efficiency in the allocation of resources. It was considered abstracting from income

distribution and with efficiency defined solely in terms of private individual interests. Maximum welfare does not exist, following this usage, if adjustments in production and distribution can result in benefit to some with no harmful effects to others. This constraint requires, because of the lack of ability to measure or offset gains and losses by different persons, that voluntary choice be the criterion for the comparison of relative states of well being. Hence if compensation for a change were freely offered and freely accepted it would demonstrate that the proposed change actually increased welfare.[1]

The idea of welfare maximization in terms comprehensible to the economist and subject to any sort of organized study rests on the presumption that motivation of individuals is based on economic gain. The assumption of purely economic motivation is, of course, an oversimplification if not a distortion. Economic motivation is only one of the factors which enters into the decision equation of an individual. Though they perhaps have a greater impact on business decisions, economic factors alone are by no means sufficient to explain even corporate behavior.[2] This study focuses on the economic variable as a partial explanation of behavior and choices despite its limitations. The reason for depending on the economic variable is that other motivational factors would be extremely imprecise and would not add significantly to an understanding of regulatory impacts on the level considered. More basically, if all other factors could be held constant, the effects of changes in the more purely economic variables, which would be marginal, could be determining. For example, whatever the conglomerate of influences (none being lexicographically ordered) that leads an individual to dedicate a reserve of natural gas to interstate commerce, variations

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[1]The basis of this didcussion was developed in the "new welfare economics." A more complete formulation of it can be found in numerous sources.

[2]For a recent direct confrontation of maximization concepts and the issue of economic motivation see Adamentia Pollis and Bertram L. Koslin, "On the Scientific Foundations of Marginalism," The American Journal of Economics and Sociology, XXI, No. 2 (April, 1962), pp. 113-30.

in the one factor of price would have the determining impact if all other factors were, or could be, held constant.

The economic variable itself is not an easily defined single item in gas sales contracts between producers and transporters, even if integrated production is left aside. Sales contracts in the natural gas field market offer many opportunities for negotiations, unless one party attempts to hold to a standard take it or leave it contract form. The price at which the gas is transferred is of course the most obvious and most important single clause in the contract, though as the discussion above in Chapter IV demonstrated, it is by no means the only one. To simply list the more important variables is to illustrate the complexity of the required negotiations. Among the variables are: size of reserve dedicated, length of contract, firmness of price, delivery pressure, purity, BTU content, number of delivery points, presence or absence of recoverable liquids, taking requirements, and peaking capacity. The other factor which influences gas price directly is the location of the reservoir with reference to the consuming area. Because of the expense of gas transportation, the most distant the reservoir the lower the price which can be offered for it. In general, it might be said that one set of factors influencing sustainable price is the cost of delivering energy to the consumption point. Any condition in the reservoir that affects the ultimate cost of energy has a bearing on price, and therefore is subject to negotiation between seller and buyer.

The negotiations between buyer and seller in a free market are of two types. These are first, negotiations on issues where trading can accomplish gains to at least one party with at least no losses to the other, and second, where opportunities for mutual gain have been exhausted. The large number of variables in a gas sales contract provide many opportunities for trading, because while "gas is gas," there are significant variations in delivery properties. Once all opportunities for mutually satisfactory trading have been exhausted the second type of negotiations begin. The price of natural gas in a package depends on the nature of the alternatives available to the producer and transporter as conflicting bargaining agents because the limit beyond which

each bargainer cannot be forced is determined by his next best alternative. Whenever the point is reached where all mutually satisfactory trades have been made, the range of the determinable welfare maximizing allocation of resources has been reached. The final resting place of the bargain will affect the distribution of income but will not affect its allocational efficiency.

The existence of attractive alternatives to both buyers and sellers in the field is therefore required to push the bargain to welfare indifference. The nature of alternatives requires some scrutiny for this reason. The pipeline transporter purchasing gas seeks gas reserves at the lowest reasonable price.[3] The market from which the pipeline can draw its supplies is the undedicated reserves within an economical distance--given price variations--of its facilities. Its potential supply is limited both by geography and by available undedicated reserves. If there are a sufficiently large number of independent potential sellers within the relevant radius then pressures to sell will be sufficient to drive the final bargain toward the welfare maximizing point.

The types of alternatives available to an independent producer are more varied though not more numerous than those of the pipeline purchaser. The independent producer can sell to a pipeline purchaser, to an intrastate fuel market, for local industrial use, or possibly can choose to hold reserves for future production. These freedoms, while circumscribed by state regulation and intrapool considerations, do, if they exist in relevant forms, make it possible for the producer to withstand purchaser pressure to the point where the final bargain can generally be assumed to be within the welfare maximizing range. Monopolistic buying power, of course, also limits producer freedom. For producers faced with monopsony and intrapool drainage, some relief is granted by state minimum price and ratable taking statutes such as those discussed above in Chapter II.

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[3]The results of Cookenboo's study in support of this position are reported above in Chapter IV. See Cookenboo, pp. 96-103.

The conclusion from this line of reasoning is that if, as several studies have found, the field market for natural gas exhibits workable competition on the producer side with some monopsony, then no field price regulation holding price down would be required for a satisfactory allocation of resources.[4] The natural gas would go to the highest value uses available to it as a commodity, and consumers would take natural gas to the limits of its usefulness compared to other means of satisfying energy and other wants. The lessening of competition, of course, would threaten this welfare maximizing allocation. Analogously, the absence of workable competition would provide the opportunity for regulatory adjustments which would possibly benefit some persons with no losses to others.

Welfare maximization defined in demonstrable private terms is not the only element in public policy. Just as the pipeline company looks to the "package" including many variables in addition to the central element of price, public policy looks to goals in addition to welfare maximization. To carry the analogy further, appropriate decisions on public policy would probably include the balancing of possibly conflicting goals. The next element of public policy to be considered in the regulation of the field sales of natural gas is another of these goals, appropriate income distribution between the producers of natural gas and its consumers.

Appropriate Income Distribution

The existence of elements of economic rent in natural gas production and sale for resale in the field leads to consideration of income distribution between producers and consumers. Economic rent is a payment over and above that required to maintain resources in their current occupation. Rent that arises from irretrievably sunk investment or from the natural attributes of a resource does not disappear with time as does rent which relies on special position which can be duplicated by entering factors. It is this permanent rent which is at issue.

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[4] See Chapter IV above for conclusions reached in various studies.

Rent is said to be demand determined because the amount of rent does not influence price but instead is determined by the price required to ration the resource among competing uses. The greater the demand for the resource, holding amount supplied constant, the higher the rent required to discourage sufficient buyers to balance available amounts supplied with prospective purchases. Whether the potential rent is distributed to the individual who controls the resource or not, it is the essence of rent that the amount of the product directly supplied is not altered. The rent nature of portions of natural gas producer incomes is identified below.

Royalty Payments

The purest and most obvious rent paid for natural gas in the field is that portion of the field price going to the owner of the reservoir because of ownership of the surface of the ground or through assignment from that surface owner. In the petroleum industry this distributive share is described as the royalty and leasing interest. Natural gas as a commodity came to be in place under the surface of the land through no actions on the part of the owner of the reservoir. He can neither increase nor diminish the amount of gas in place through his actions. Since to him the gas has a zero cost of production, and since in any case no more gas can be produced, no payment is required to call forth the gas. Any payment made to the reservoir owner, then, is in the form of pure rent and has no influence on amount of gas supplied by him. Because of transfers and prospective payments, the owner of the subsurface rights might suffer an actual as well as opportunity loss if rent were not paid, but this would be a nonmarginal loss which would not influence production decisions. The reservoir rent situation is illustrated by the simple diagram, Figure 4, on the next page. If OQ represented the amount of gas producible from a certain reservoir, the owner would be willing to sell that same amount of gas at price OC or price OA, or price OB, according to the demand for the gas. The cost of gaining control of the gas is immaterial to the owner's decision. If the owner had paid OA to obtain control over the reservoir, and the

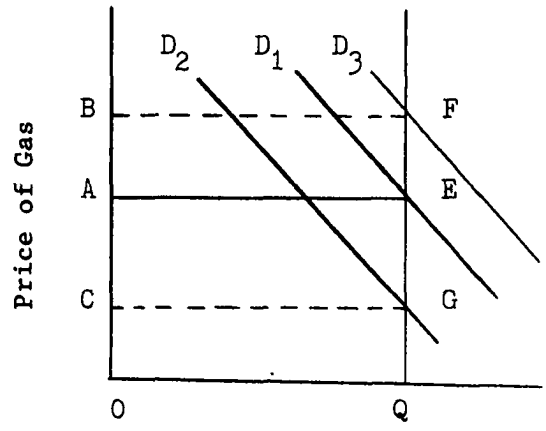

Figure 4

Reservoir rent under different demands for petroleum

demand for it was D_2, he would suffer a loss of CGEA, but this loss would not induce him to alter the amount of gas he offered for sale. On the other hand, if he could obtain OB for the reservoir (demand D_3) a gain of AEFB would be secured. Again, no change in amount supplied would result.

The amount which the owner of a gas reserve can exact under free bargaining depends upon the demand for that particular gas reserve. The owner of the reserve can exact only so much as will make the prospective purchaser indifferent between that gas reserve and the marginal alternative, that is, the best source of gas (or other means of satisfying the particular want gas satisfies) which is not being used. Regulation can remove this entire payment from the owner of the gas reserve and redistribute it to some other use without affecting the amount of gas that will be made available by those who control the right to produce gas through their control of reservoirs.[5]

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[5]The property owner would, of course, have to be compensated for actual damages resulting from drilling and producing activities.

Producer Rent

Rent accrues to the producers of natural gas as well as to the royalty holders. Production is here defined to include the discovery, development, and operation of gas production facilities. The payments covering the costs of operation of developed reserves merely represent the costs of making the gas available. These direct costs, plus a rate of return consistent with the return in alternative occupations, must be paid to the producers if they are not to move out of the industry over time. This payment is not available for distribution without an influence on supply. Payments which compensate for gas use which reduces the value created by the discovery and development of the reservoir are not elements of producer rent. It is true that once the reservoir is discovered and the development wells drilled these costs are sunk and any net return will retain the production on the stream in the short run. In the long run, however, if these costs are not met further exploration and development will cease and supply will fail. Any rent derived from the sunk nature of the costs, then, is of a transitory nature and cannot be redistributed without effects on the long run supply of gas.

There are two purely rent categories of payments which can be redistributed without altering the long run supply of gas. The first of these is payments for "costless" discoveries of gas reserves and the second is payments to producers over and above those necessary to maintain a given level of exploration and development. They are discussed below in turn.

"Costless" discoveries

Exploration did not proceed with the intent of discovering either oil or natural gas reserves when the state of the geologic art was less advanced. The knowledge of the day could only suggest areas where entrapment of mobile hydrocarbons was possible, but whether any hydrocarbons found would be in the gaseous or liquid state could not be predicted. In those days of low gas value the object of the search was oil, and any gas found could properly be considered an unintended and

for that reason "costless" by-product of the search for oil. The return from all gas discovered in this way was in the nature of rent, a windfall gain to the oil explorer which could be appropriated without significantly influencing the exploration for or development of gas reserves. To the extent that gas return contributed to the joint return from exploration, however, the total income from exploration rose. Increased supplies of both products resulted if this return was meaningful in the total exploration context. The present value of most older gas reserves in the Southwest arose from no intended effort; it thereby represents potential rent income such as we have been discussing. Recently discovered gas reserves present a somewhat different picture.

The increase in the demand for gas which brought higher field prices for gas changed the relationship between price and output. The knowledge of reservoir characteristics improved in the postwar period to the point where reliable predictions of hydrocarbon form were possible. The combination of higher price and predictability caused sales conditions to become a significant factor in determining the amount of gas discovered. Even at present, however, all gas reserve discovery is not explained by the price of gas. Phillips Petroleum Company, which has pioneered in separating its exploration into oil and gas divisions, finds that its predictions of hydrocarbon form are correct only something over 80 per cent of the time.[6] Therefore pure gas reserves are still being found in the search for oil. Moreover, gas in commercial quantities not required for field operations is sometimes associated with liquid petroleum discoveries which would be produced whatever the price of gas. In summary, the older gas reserves were frequently costless as to discovery, just as are some of the more modern gas discoveries. Therefore some of the payments for reserves to those who discovered them are economic rent and its payment is not required for the maintenance of the industry.

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[6] C. M. Allen, "Depth makes a difference in the search for Natural Gas," Oil and Gas Journal, LIX, No. 17 (April 24, 1961), p. 103.

Excessive discovery return

The final broad category of rent payments to natural gas producers are those payments which exceed the expectations which motivated the exploration. The gross return to the discoverer of a gas reserve depends on two factors, the amount of gas discovered and the price at which that gas is sold. The amount of gas discovered by an individual producer as the result of a given amount of exploration expenditure is subject to wide variation. The larger the aggregate, the broader the sample considered, the smaller the range into which success ratios are likely to fall. The entire industry over a series of years would be the limiting case. In this case, with a high degree of certainty the success ratio could be predicted to fall within narrow limits, assuming no changes in basic technology or other conditions. Though it is the individual producer who receives the rent from chance discovery of bonanza production, and also the individual producer who suffers a long series of dry holes, the industry as a whole is the relevant decision entity when analysis of the supply of natural gas is concerned. In this analysis the expectations for exploration and development success will be assumed to be correct in terms of quantity of gas discovered.

The price of gas, and therefore the value of the predicted discoveries, is another matter. At any given time there exists a given set of price expectations which are used as one of the factors going into the industry investment decision. If the price on which the allocation decision was based is verified by experience, then the exploration will yield the going rate of return adjusted to the special conditions of uncertainty under which the decision was made. But whatever the price experienced, once a commitment of resources to exploration and development has been made the result of that exploration and development will be placed on the market. Under these conditions, the expected price which would call forth an appropriate amount of exploration would be the necessary cost of maintaining the desired supply of natural gas. Any price above that expected would result in redundant profits. Any price below that expected would result in a loss. Whatever the experienced price, however, the expected price is what determines how much exploration

will occur. As a practical matter, of course, expectations unfulfilled result in revisions of future expectations in the absence of a clear indication to the contrary. It follows that a regulatory policy which led to fulfillment of the price expectations required to bring about the predetermined desirable level of gas discovery would successfully replace demand determined rent. Under this regulation return to producers would compensate them for remaining in their occupation. In the case of an upward trend in the demand for gas such as the United States has experienced the economic rent avoided by regulation would be available for distribution. Similarly, if gas value were falling, losses would be shiftable from the producers to the consumers if a decision to do so were made. These changes in the distribution of income, to repeat, would be possible without changes in the amount of gas supplied to the field markets so long as appropriate (nonmarginal) methods were used.

Three sources of economic rent have been isolated in the discussion above. These are 1) royalty payments; 2) "costless" discoveries (those not motivated by a conscious search for gas); and 3) the difference between expected discovery return and that actually experienced. The decision as to the amount of rent which is to flow to the producers is in essence a noneconomic one. It is based instead on value judgments as to the relative merit of the claim of the conflicting interests. It is necessary that such judgments be made on the basis of broad public policy because market decisions have no external claim to justification in this regard. Problems of distributing economic rent in ways other than it is now distributed will be considered in later chapters.

The national interest in natural gas use is affected by the distribution of economic rent because under laissez faire that rent is distributed through a price pattern which does affect producer and consumer decisions. The higher the price, the greater the number of resources which can be sustained in a profit oriented industry--and the higher the rent return to the supra-marginal producer. Similarly, the price of a commodity also allocates the amount supplied among competing uses. Holding other things equal, the price of gas determines both the size of the market, for example that for fuel, and the division of that particular market among natural gas and its potential substitutes. In

the case of a depletable resource with a variable rate of production, price to the consumer influences allocation over time as well. This allocation of natural gas over time is a matter of national importance as well as one of individual concern.

Regulation to Promote the National Interest

The essence of the "national interest" question is the hypothesis that the interests of a society are not necessarily the same as the sum of the privately experienced interests of the individuals who make up that society at any one point in time. The difference in interests leads to the necessity for public policy either to accept a continuing predominance of private individual interests, or to balance all interests through appropriate social interference by means of the only instrument available, government. The first chapter of this work, and the introduction to this chapter, mentioned the national concern in the allocation of natural gas over time. Many of the nominally separate public policy questions in natural gas regulation are concerned with one or another form of this issue. Less important unrelated national issues exist too, but they are ignored for reasons of brevity and simplicity of presentation.

Two responsibilities rest on any argument that government interference in economic activity is needed to further the national interest. First, it must be demonstrated that the national interest does indeed differ from the sum of individual interests, and second, a method of successfully furthering that national interest must be presented. The concentration in this chapter is upon the first of these matters.

Individual interests are developed and expressed within a context of a given society and a given set of expectations about the course of future events. The goals and interests of the nation, however, are established in a much broader context and therefore are subject to an even greater range of alternatives. So long as this basic difference in frame of reference exists, the distinction made here between individually and socially oriented interests does not require either a

rejection of the individual as the valuing unit or the establishment of an anthropomorphic "State." All that is required is recognition that while individuals make their preferences known within a given context, these same individuals acting as the group called a nation can change the decision matrix within which they are bound as individuals. To explain by analogy: One firm in the pure competitive model has no influence over price; all such firms taken as the industry do set the price which the individual firm must take. The mechanism of change and the stimulus which leads to divergent values is of no interest to us here so long as such divergence is accepted as possible.

The economic interests of individuals qua individuals are expressed primarily through a market system such as was described earlier. One of the choices expressed through the market is the allocation of any depletable resource over time. Given the usual assumptions, the rate of natural gas use would be such as to maximize the sum of the present value to individuals of future use of the gas after an appropriate discount for the passage of time.[7]

The national interest would possibly be quite different from the individual interests and as a result would require different rates of natural gas consumption. There are three conditions under which such interests do not coincide. The first example of such a difference is the lack of identity of goals or basic values. Individuals within a market framework seek to maximize their personal satisfactions, whatever those might be. The nation, however, must concern itself with such other ends as national defense, overall economic growth and development, and its role in international affairs. The stability of the social fabric might, for another example, require a distribution of income outside the range of efficiency or production indifference. The economic

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[7]The market in this context would be assumed to operate perfectly as the limiting case. Imperfect markets would obviously establish theoretical conditions for intervention since even private welfare would not be maximized. Our task at this point is to establish conditions wherein the national interest is not satisfied even in the presence of private welfare maximization and appropriate income distribution.

development of one region, or the depressed state of another, might require politically palatable though uneconomic adjustments of gas use over time. For reasons of different goals the national interest might require different gas use patterns than those which would be most satisfactory to the citizens in their private lives.

The difference between individual and national time horizons are also significant in this regard. The rate of discount applied by an individual when determining decisions on matters involving time depends, to some extent, on the transient nature of his existence. Man's planning horizon is limited, and time is valued accordingly. The nation, however, is not subject to inevitable decline and extinction. In a phrase, the nation's concern is long run continuity. Or, in a somewhat different light, the nation promotes equity or justice among all its citizens, among those of the current generation and between the present and future generations as well.

The final example of aspects of resource allocation which bring different optimal results according to the valuing framework is the breadth of the national concern at any point in time. Individual interests include those of the direct participants in market transactions and those rather directly affected by the transactions. All individuals who are affected by a given set of transactions are not able to influence the results of bargaining.[8] The sum of these indirect effects of gas use patterns might be more important than the direct effects, but they would be ignored under private market decision making. For this reason, then, the national interest may differ from the sum of the individual interests.

Sub-optimal temporal allocation of gas, from a national viewpoint, leads to no automatic conclusions about the wisdom, necessity, or form of social action to change that allocation. The only inference which can be drawn is that the matter is one of concern to public policy and therefore explicit consideration of it is appropriate. Decisions among alternatives considered would rest on value judgments. Choice of

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[8] External economies and diseconomies, for example, are a special case of the indirect effects described here.

an appropriate regulatory policy would require three steps: first, determining what values should be considered under the heading of the national interest; second, estimating the use rates which would optimize these values; and finally, reconciling the national interest with private welfare maximization and appropriate income distribution policy. It is to this last question, the reconciliation of various public policy concerns, that the discussion now turns.

Goals and Their Fulfillment in Natural Gas Field Sales Regulation

Three different public policy concerns in the regulation of the field sales of natural gas were identified above. They were maximum welfare, appropriate income distribution, and the national interest in the use rate of gas over time. Each of these elements was considered more or less separately from the others. Yet, active regulation requires joint consideration of all values to which expression is sought. In developing and applying a specific program all other things cannot be held equal. Change of any variable to express one value probably has an effect on the satisfaction of all others. Optimal regulation requires, then, the development of a "package" which unifies, if possible, and compromises if not, the joint effects of efforts to reach particular ends.

The first task of regulation, viewed in this light, is to determine exactly what ends are sought and with what priorities. Specific or quantified content cannot be supplied for the generalities of policy values by data or economic reasoning alone. This content must flow from value judgments, but preferably those based on the most complete information available. The second task of regulation is to develop feasible techniques which both in their proximate and more removed impact fulfill welfare maximizing criteria. This section deals with the content of regulation while particular regulatory techniques are considered in the chapters below.

The package nature of the joint goals sought in gas field price regulation form a desired welfare frontier. Though more difficult to

deal with conceptually than single variable maximization, administratively a frontier is easier to approach than a given single point. The plurality of variables makes administrative flexibility possible. Compromise can be used to reduce individual resistance and balanced movement toward the desired result can be achieved.

The problem of putting content into this package, of specifying a maximizing social welfare function, remains. Quantification of specific parameters for various elements in the social welfare function will not be attempted in this context. The social values which determine a maximizing function can only be validated through the established evaluative organs of the society, and the opinions of this writer, per se, are neither conclusive nor persuasive. Some general comments about the nature of that social welfare function are appropriate within these limits.

No functioning society is without a public policy which can be thought of as the embodiment of certain values. For example, in the absence of direct public regulation of the gas industry, gas is allocated to certain uses, its use is distributed over time in a certain fashion, and income is distributed in given ways. In this case the public policy is laissez faire and the inferred social welfare function associated with it includes the results of this policy. Discussion of whether there is to be a public policy toward the natural gas industry, or of whether any public policy has a co-ordinate social welfare function, is not meaningful because policy always exists and with it a social welfare function is expressed. Moreover, since there is a community consensus of a passive, if not active, nature which accepts all which it does not change, that public policy must be at least acceptable. The questions that remain concern the nature of the welfare maximizing function and establishment of a public policy to satisfy its conditions.

The attempt to establish a conceptual social welfare function that demonstrably maximized or even increased welfare measured in individual terms has had only very limited success. Only two verifiable statements can be made about the social welfare effects of any

given action. First, a prospective change increases welfare if it is preferred by at least one person and no one opposes it. Second, if a change yields sufficient benefit to enable the gainers to voluntarily compensate the losers for their losses, and if as a consequence of the payment of compensation the potential losers voluntarily agree to the change, then welfare is also increased. One statement encompasses both these points because the payment of compensation establishes the unanimity conditions of preference and indifference, substituting a combination of changes for just one. Beyond these meager results there have been few positive conclusions from the search for conditions under which the welfare effects of economic change could be determined. Welfare economists have, however, succeeded in specifying the necessary conditions for determinable welfare gain. On the negative side, they have been able to reject certain hypotheses which would have, if verified, widened the scope of determinable results.[9]

The implications of the work of the welfare economists need not be stultifying with regard to public policy despite the lack of positive results from the analysis. The nature of the knowable has been shown to restrict opportunities to make positive statements about the welfare impact of any given proposed change taken by itself. But with equal force the status quo has been stripped of any standing as a preordained good. While welfare economics has not given policy makers the tools to establish any alternative as unconditionally preferred, it has with the

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[9]While the literature in welfare economics is extensive, three surveys present a suitable overall view of the sweep of the subject. Hla Myint, Theories of Welfare Economics (Cambridge, Massachusetts: Harvard University Press, 1948) deals with the classical and neo-classical welfare theories. I. M. D. Little, A Critique of Welfare Economics (Oxford Paperback, 2d ed.; London: Oxford University Press, 1960) deals primarily with the "new welfare economics" which is based on the switch from cardinal to ordinal utility measurement and the inability to compare utility interpersonally which resulted from its acceptance. A recently published book, Jerome Rothenberg, The Measurement of Social Welfare (Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1961), brought the survey consideration of relative welfare states through the more recent hypotheses.

same force freed policy action of the necessity of maintaining the status quo unless the unanimity condition could be satisfied. Responsibility has been placed directly upon the decision making process and the value judgments of the decision makers within that process. Operationally, then, effective public policy requires that a system be established which can determine and express the maximizing societal values.

The public policy toward the natural gas industry existing at the time of this study rejected the results of laissez faire in favor of direct regulation. It had been decided that certain institutional channels would be used to answer many of the allocative and other questions in the industry even before the field price regulation issue reached the Supreme Court in 1954. At that time, however, there were no existing means of making decisions on field price issues. A regulatory process had to be worked out.

There are two requirements for a regulatory process which will facilitate determination of the appropriate parameters of a maximizing social welfare function. It has to both satisfy the existing consensus of appropriate policy goals and also be adaptable to changed and changing welfare parameters. The focus of analytical concern with regulatory policy lies in the means by which the value judgments of the community are gauged and placed into operation as effective public policy. The crucial matter for analysis is the dynamic of regulation, the decision making process itself.

Paradoxically enough, concentration on the process, rather than on attempts to establish scientific welfare maximizing solutions to public policy issues, leads to a resurrection of some potentially verifiable welfare conclusions.[10] The acceptance of a given decision making process has welfare implications. If one process is accepted, then the choices of policy alternatives made through that process must be expected to be preferable to other packages made up of all other

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[10]The final chapter of Rothenberg's book, "Social Choice of a Social Welfare Function," pp. 309-36, contributed to the writer's thinking at this point.

alternatives plus the change in the decision process required before each of these other alternatives would be instituted. To be accepted passively the package of the process and its results are not required to be optimal, but they must be preferred to change along with resulting uncertainty. This conclusion is perilously close to "whatever is, maximizes social welfare." There are two factors, however, which make the conclusion significant rather than trivial. First, an adjustment element is included which is weighted toward change which will lead to increased welfare as judged by the community which selected it. That is, the fact of adjustment implies that in the ongoing process itself the drift of regulation decisions will be toward greater welfare because choice is exercised expressing social preferences. Second, the values of the individuals who are the community are to a great extent framed through acceptance of the decision making process itself. It forms part of the "value matrix" mentioned in distinguishing between the individual and the national interests. Therefore the decision process, to which the individuals in the community are committed, is partially self-validating. The decisions made approach the unanimity criterion because the values of a going community adjust to the results of the accepted decision process. Rather than "whatever is, maximizes social welfare," a more appropriate phrase would be "whatever is becoming, is approaching social welfare maximization."

Rothenberg put a similar thought in these words:

> This structure of <u>system</u>, is given content by certain strategic decision-making institutions in the society. . . . These decision-making processes are approved as the rules of the game and their decisions are approved in advance. Such decisions are legitimized articulations of the group's values. Since socialization in a going society commits most individuals so deeply to established values in seeking to fulfill their desires, acceptance of these strategic social processes is a most important means by which these individuals uphold their own values. These processes become themselves important values. And they create by their functioning other social values. Since they are choice mechanisms they separate chosen from rejected alternatives. In this way they differentiate, and define by this very differentiation, socially desirable and socially undesirable alternatives, or more generally, they rank alternatives as to the degree of social desirability. . . . The basic consensus extends to social validation of decision

> processes whose choices concern the social state alternatives of welfare economics; the consensus extends to choice of an "official" Social Welfare Function.[11]

It must be recognized that nothing that has been stated above has moved us toward the welfare economists' goal of an objective and verifiable determination of maximum welfare positions. Value judgments still abound, not the least one of which is the acceptance of the decision process itself as the central variable in and about which all value conflicts can be resolved or compromised. There is no method of demonstrating that the answers received in the quest for maximum social welfare, or in the selection of a social welfare function, are actually maximizing welfare. There is no method of demonstrating even that the essence which we are maximizing is welfare, even if we succeed in maximizing it. But through specification of variables the policy maker has opened the value choices to the evaluative and corrective process of public examination.

The goals of regulation are a matter of policy determination. The means of regulation, which include both the decision process and the regulatory method itself, must be adjusted to the tasks that are set by the goals selected. Hence regulation techniques can be judged in terms of their success in fulfilling accepted goals, while the goals themselves can be judged ultimately only in terms of other goals. Whatever the specific content of the maximizing social welfare function, it is possible to determine whether regulatory methods could accomplish the general ends sought. Two regulatory methods are considered in the next two chapters. The nature of the experience with the methods is specified, when applicable, and then the techniques are evaluated by analyzing whether or not they are able to fulfill the basic regulatory purposes presented in this chapter.

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[11] Rothenberg, pp. 316-17.

CHAPTER VII

REGULATION OF INDEPENDENT PRODUCERS OF NATURAL GAS: THE PUBLIC-UTILITY APPROACH

The FPC was granted jurisdiction over the sales of gas for resale in the field by independent producers in 1954 when the Phillips decision was rendered.[1] With the decision in the case styled Deep South, the legal issue of FPC jurisdiction over independent producers selling in interstate commerce was settled.[2] The immediate FPC reaction to jurisdiction was to freeze rates at the levels existing as of June 7, 1954, and to cause all rate changes to be held in abeyance or collected subject to refund until some regulatory procedure could be devised. With rates held stable through this expedient, the FPC began its efforts to find a means of dealing with the new situation in which it found itself. The traditional public-utility approach was the first such means explored by the Commission. The operation and implications of this method of regulating the sales for resale of natural gas by independent producers are discussed below.

The FPC, it is rather clear, had no definite idea of the direction it wished to take with reference to producer regulation when the supervisory function was forced upon it. The goals to be sought in this regulation were not settled nor were the alternatives specified. Its experience had not prepared the FPC for the role of allocating, either directly or indirectly, natural gas among competing uses and over time, though the Commission was familiar with income redistribution issues because of its regulation of the interstate pipeline companies.

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[1] Phillips, 347 U.S. 672.

[2] Deep South, 247 F. 2d 882.

Moreover, apparently the Commissioners and the FPC Staff, as well as the natural gas production industry, expected the Congress to pass amendatory legislation to remove producers from regulatory control.[3] This expectation reduced the pressure on the Commission to arrive at some regulatory method. A relaxed regulatory atmosphere was retained until it became apparent that legislative relief from this responsibility would not be forthcoming. Finally, action was initiated on the Phillips case which was pending from its original filing and from the specific court order remanding it to the Commission for further consideration.

There was no established procedure for independent producer regulation to which the FPC could turn. The sole analogous problem faced by the Commission was in the determination of allowances for gas produced by the interstate pipeline companies to their own account. In 1954 the Commission attempted to replace the traditional cost-based regulation with the fair-field method in a rate proceeding involving Panhandle Eastern Pipeline Company. The judicial review of this Commission decision, styled City of Detroit, forced the FPC to revert to the cost or rate-base approach.[4] It was this same rate-base method that was adopted as a working principle in the efforts to establish a price for gas produced by Phillips. In effect, there was no positive decision to use the cost approach; it was simply the only accepted available alternative when the time for action came.

The remainder of this chapter is divided into two parts in its analysis of the cost method of regulating jurisdictional sales by independent producers.[5] The first of these discusses the use of the

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[3]John C. Mason, General Counsel, FPC, "Problems in Regulation Under the Natural Gas Act of Interstate Operations of Producers," Before Mineral and Natural Resources Law Section, American Bar Association, August 8, 1961, (Mimeo.) pp. 5-6. Speech reprinted in Public Utilities Fortnightly, LXVIII, No. 7 (September 28, 1961), p. 512, under the title "Producer Problems Under the Natural Gas Act."

[4]230 F. 2d 810. See the discussion in Chapter III above.

[5]The firm by firm, cost-based, traditional, public-utility type regulation of the independent producers is termed the public-utility approach in this work. The public-utility approach is differentiated

rate-base method for establishing gas prices for Phillips and on the later rejection of this approach as the general solution to independent producer regulation. The final portion of the chapter analyzes cost-based regulation in the light of selected public policy goals, those discussed above in Chapter VI.

Regulation of Independent Producers Under the Cost Approach

The first, and as it turned out, only, traditional cost-of-service rate study of an independent producer involved the Phillips Petroleum Company and the same proceedings, Dockets G-1148, et al, which gave rise to the Supreme Court test case on jurisdiction. On November 22, 1954, the Commission vacated the order issued August 22, 1951,[6] terminating proceedings under the Natural Gas Act. It ordered that the proceedings be reopened to determine

> . . . whether in connection with any transportation or sale of natural gas, subject to the jurisdiction of the Commission, any rates, charges, or classifications demanded, observed, charged or collected by Phillips, or any rules, regulations, practices or contracts affecting such rates, charges or classifications are unjust, unreasonable, unduly discriminatory, or preferential.[7]

If charges or other aspects of Phillips' operations were found to be contrary to those required by law under the Natural Gas Act, the Commission ordered that appropriate charges be determined. It was not until May 28, 1956, that the Commission consolidated proceedings; it ordered that hearings begin June 26, 1956. Various other filings and dockets from time to time were added to the case. The hearings closed

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from other regulatory methods by the fact that it is on a firm by firm basis, and that price is set so as to yield no more than the cost of service and some appropriate return on the prudent, depreciated investment rate base.

[6] 10 F. P. C. 246, 283.

[7] Order Vacating Termination of Proceedings and Continuing Investigation of Phillips Petroleum Company, 13 F. P. C. 1527 (1954).

December 18, 1957, after 82 hearing days and the compilation of a 10,620 page hearing record, not including 235 exhibits. The Presiding Examiner, and author of the Examiner's Decision, was Joseph Zwerdling.[8]

The Examiner's Decision

The Examiner's Decision in the Phillips case was issued April 6, 1959. This 230 page mimeographed document included a summary of the hearing testimony assembled and organized with reference to the major issues as identified by the Presiding Examiner. The Examiner first considered the rate-base method and its feasibility. Then he examined the positions of the four major parties to the case, Phillips itself, the FPC Staff, the Eastern Seaboard Intervenors, and the Wisconsin Intervenors, on various regulation issues. These proposals were considered by subjects, some of the most important and relevant of which are discussed below. The final portion of the Examiner's Decision was given over to the Order putting the findings into force and to appendix tables which brought together the various findings on specific issues.

Feasibility of public-utility regulation

Examiner Zwerdling commented directly on the feasibility and desirability of the public-utility method. He stated that the general attacks on the method had taken the form of contentions that it was "unworkable, that it presents monstrous problems which are impossible of solution, that it is administratively unfeasible, and that it produces incongruous results."[9] Zwerdling pointed out that the Phillips

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[8] In the Matters of Phillips Petroleum Company: Decision Upon Consolidated Proceeding Under Sections 4 (e) and 5 (a) of the Natural Gas Act to Determine Just and Reasonable Rates for an Independent Producer, Docket G-1148, 24 F. P. C. 590 (1959). (Hereinafter referred to as the Examiner's Decision.) This writer referred both to the original mimeographed document distributed to the parties in the proceeding and to the decision as reported in the FPC Reports. Citations whenever possible refer to the official reporting.

[9] Ibid., p. 601.

study was the first thorough analysis of the operation of the rate-base method. A great deal of industry material was read into the record to set the stage for producer regulation, and much time was spent in exploring alternative solutions to problems posed by the new departure in FPC regulation. In addition, there were a great many intervenors, all of whom had to be heard.[10] Phillips, which company prepared the data justifying its rate proposals, did not contend that the method was unworkable or unduly complex, Zwerdling remarked. There was a two year wait between the instigation of the investigation and the beginnings of hearings which explained some of the long delay before the filing of the decision. The time taken for the Phillips matter, Zwerdling concluded, would certainly be shortened in future proceedings.[11]

In more general terms, the Presiding Examiner argued positively that use of the public-utility approach to producer regulation was feasible and desirable. It was established, for example, that Phillips had been able to provide all data that was reasonably required for cost-of-service determination. A period of experience with regulation and a uniform system of accounts were expected to make the task even less difficult for other producers. Of course, the allocation of joint costs between jurisdictional and nonjurisdictional sales required admittedly

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[10] Mimeographed copy, Examiner's Decision, pp. i-iv. A list of the intervenors in this case points out the widespread interest it engendered and, incidentally, the disparate interests involved. Intervenors included: Northern Natural Gas Company, Permian Basin Pipeline Company, Texas Gas Transmission Corporation, Panhandle Eastern Pipeline Company, Michigan-Wisconsin Pipeline Company, Consolidated Gas Utilities Corporation, Council Bluffs Gas Company, Minneapolis Gas Company, Public Service Commission of Wisconsin, State of Wisconsin, City of Detroit, Michigan Public Utilities Commission, Metropolitan Utilities District of Omaha, Brooklyn Union Gas Company, Long Island Lighting Company, Public Service Commission of the State of New York, Public Service Electric and Gas Company, United Gas Improvement Company, Consolidated Edison Company of New York, Philadelphia Electric Company, County of Wayne, Michigan, Mississippi River Fuel Corporation, Pacific Gas and Electric Company, El Paso Natural Gas Company, Southern Counties Gas Company of California, Southern California Gas Company, San Diego Gas and Electric Company, California Public Utilities Commission, State of California, Minnesota Valley Natural Gas Company, and Northern States Power Company.

[11] Ibid., pp. 601-603.

artificial determinations. But to put the allocation problem into perspective, similar problems were faced in pipeline regulation as well. The inability to resolve these issues with scientific accuracy did not prevent cost-of-service regulation in the gas transmission industry. Satisfactory, if not perfect, solutions could be found in gas production regulation as well. While admitting that complexity and imprecision were part of any regulation, Zwerdling remarked that the courts upheld good faith regulation so long as it did not violate due process or substantive guarantees.[12]

Zwerdling concluded that the cost-of-service, rate-base method was workable if 1) the Commission came to some determination on criteria, standards, and methods; 2) a uniform system of accounts and records keyed to the criteria, standards, and methods chosen were established, and 3) experience were accumulated in a case by case way.[13]

Zwerdling decisions on major issues

No attempt to summarize or even categorize the involved findings reported in the Examiner's Decision will be made here. They lost their particular significance when, in 1960, the Commission abandoned the public-utility method for the area-price approach.[14] Five elements of the Examiner's Decision did, however, bear on Commission policy or on the use of the public-utility method for regulating sales for resale in the field by independent producers. These five items were: 1) the "phantom tax" allowance; 2) the rate of return to be allowed on prudent dedicated investment; 3) the allocation of costs between jurisdictional and nonjurisdictional business including the allocation of exploration costs; 4) the treatment of escalation contracts in force between Phillips and some of its suppliers; and 5) the choice between systemwide or

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[12] Ibid., pp. 603-606. [13] Ibid., p. 607.

[14] Statement of General Policy No. 61-1 Establishment of Price Standards to be Applied in Determining the Acceptability of Initial Price Proposal and Increased Rate Filings by Independent Producers of Natural Gas, 24 F. P. C. 818 (1960). (Hereinafter referred to as Area-Pricing Statement.)

production-area bases for rates. These problems are discussed in turn below.

Phantom taxes

The percentage depletion allowance at the time of the Proceedings on producer regulation made it possible for firms in extractive industries to deduct a certain per cent of total income from their taxable income to offset using up the discovery value of a depletable asset. The percentage depletion allowance could be taken without regard to other deductions or depreciation. In the petroleum industry the depletion allowance at this time amounted to the lesser of 27.5 per cent of gross income or 50 per cent of net income. Firms engaged in petroleum exploration and development were also allowed to expense-off intangible drilling costs even if the firm capitalized them in its own accounting. This enabled the firms to defer taxes, because of the higher earlier write-off, and provided in effect an interest free loan.[15]

Phillips contended that it should be allowed, as a cost-of-service, the amount of federal income tax it would have paid if these two tax provisions had not reduced its actual tax liability. In this case the sum amounted to almost $12 million out of a total cost-of-service, as calculated by Phillips, of $92 million.[16] Phillips argued that it was the intent of Congress that this tax reduction should serve as an incentive for exploration and development. If such intent did exist, the FPC had no power to make the saving available to the consumers.[17] Phillips relied on the Court of Appeals decision in the City of Detroit case for legal precedent. The Commission in that instance was ordered to allow Panhandle Eastern the tax advantages accruing from

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[15]Intangible drilling expenses are those associated with development of producing property which are not in the form of land or equipment. Such expenses include road building, site preparation, and real estate damage. Examiner's Decision, p. 707.

[16]Ibid., pp. 708, 615.

[17]Ibid., p. 709.

the accelerated amortization provisions of Section 216 of the Revenue Act of 1950.[18]

The Presiding Examiner rejected the request for the phantom tax allowance. He pointed out that the depletion allowance and the tax treatment of intangible drilling expense antedated the Natural Gas Act and producer regulation. The Congress could have written the tax privileges into the Natural Gas Act, but since it did not, Zwerdling contended that no such Congressional intent was present. On Phillips' general arguments for the allowance on the basis of need, the Examiner concluded that the company should show cause for a higher rate of return directly rather than attempt to gain its objective through the confusing method of an allowance for phantom taxes. The City of Detroit decision on treatment of accelerated amortization was rejected as a precedent because of the difference between a tax deferral and a tax reduction. The City of Detroit situation was also held to differ from that at issue because the accelerated amortization provision was a temporary national defense measure specifically designed to aid the qualifying firms. Further, the 1950 Revenue Act (accelerated amortization) came after the Natural Gas Act, reversing the relationship between the Natural Gas Act and the depletion and intangible drilling costs provisions of the tax code.[19]

The Amere case was also rejected as a precedent for the Phillips position.[20] Following Amere, natural gas companies could use the liberalized depreciation methods approved by the 1954 Internal Revenue Code in calculating their tax, and straight line depreciation in determining cost-of-service for regulatory purposes. According to Zwerdling, the distinguishing elements between Amere and the Phillips matter were again Congressional intent and the distinction between a tax deferral and a tax saving.[21]

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[18] Ibid., pp. 716-718, citing City of Detroit, 230 F. 2d 810, 822.

[19] Examiner's Decision, pp. 711-717.

[20] In the Matter of Amere Gas Utilities Company, 15 F. P. C. 781 (1956). (Hereinafter referred to as Amere.)

[21] Examiner's Decision, pp. 718-719.

Rate of return on rate-base

The choice of an appropriate rate of return to be allowed Phillips on its dedicated jurisdictional investment required a decision on whether the gas production industry was to be granted special treatment because of its nature or whether it would be judged on the same criteria as other public-utility regulated industries. Zwerdling suggested the rate of return elements first set down in the Bluefield and Hope cases.[22] The allowed rate of return was that which would (quoting Hope) ". . . enable the company to operate successfully, to maintain its financial integrity, to attract capital, and to compensate its investors for the risks assumed. . . ."[23] The Examiner rejected Phillips' contention that it should receive special compensation for risk. He pointed out that all exploration and development costs, including non-productive exploration, were fully covered as a cost-of-service item. Moreover, Phillips had a better success ratio than other firms in natural gas production and exploration. In addition, financial risk was less than physical risk because Phillips operated in a large number of areas. Zwerdling concluded that an appropriate rate of return based on the traditional factors would compensate the natural gas company for risk.[24]

A sample of companies with characteristics similar to Phillips was chosen as the basis from which an appropriate rate of return would be derived. An average earnings-price ratio for common stock was calculated using the five year period 1951-1955 to eliminate short term fluctuations. This process yielded a rate of return of 8.5 per cent, compared to the observed 8.8 per cent for Phillips.[25] To this was added .75 per cent for financing costs and .75 per cent "fudge factor" to attract capital at a price which was appropriate given the book value

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[22] Bluefield Water Works and Improvement Company v. Public Service Commission, 262 U.S. 679 (1923) (Hereinafter referred to as Bluefield.); Hope, 320 U.S. 591, cited in Examiner's Decision, p. 723.

[23] 320 U.S. 591, 605, quoted in Examiner's Decision, p. 724.

[24] Examiner's Decision, pp. 726-728.

[25] Ibid., pp. 742-745.

of the equity outstanding. There was approximately 11.6 per cent of the capital structure outstanding as debt at an average cost to Phillips of 3.2 per cent. An adjustment of .79 per cent, rounded to .75 per cent, was made to provide the desired equity return of 10 per cent. After all adjustments, the rate of return allowed Phillips on its total investment was 9.25 per cent.[26]

Allocation of costs

Phillips' operations included the production of jurisdictional gas, nonjurisdictional gas, and petroleum liquids. General and joint costs had to be allocated among these phases of Phillips' operations so that the cost of the jurisdictional portion could be added to the cost of service to be recovered through regulated rates. After the basic allocation between gas and liquids, the separation of jurisdictional and nonjurisdictional gas costs was made on a volumetric percentage basis and presented few difficulties.

There were three basic gas-liquid allocations to be made. The first of these was made up of production costs between gas and liquids when the two were joint products. Zwerdling chose the relative cost basis for distributing these costs. In this method costs of production of oil and of gas separately were first determined. The relationship between the per unit costs of the two individually was then used to allocate lease joint costs on the basis of the volumes of each produced.[27] Granting gas an allowance for the lifting of oil, as was proposed by some parties to the proceedings, would increase Phillips' observed revenues from natural gas. In his decision Zwerdling adopted the position that the gas lifting contribution in joint product leases was present but of such indeterminate value that it would be best to avoid any consideration of it.[28] Therefore the amount that Phillips could recover from the sale of gas was not reduced by this contribution to oil production.

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[26] Ibid., p. 748.

[27] Ibid., pp. 623-625.

[28] Ibid., pp. 631-633.

Jurisdictional exploration cost allowances presented the most important and controversial allocation problem in determining Phillips' cost-of-service. Until a well is actually drilled, the contents of a suspected underground trap are unknown. It may contain nothing, water, crude oil, a gas-crude oil mixture, gas and crude oil with a gas cap, dry gas, or gas with associated natural gas liquids. No "proper" or objectively correct means is available to decide what portion of exploration expenses should be borne by jurisdictional gas because there is no way of determining or separating these expenses by final product sought. While for successful wells cost distributions can be made on the basis of what was found ex-post, for dry holes even this contact with objectivity is not available. Various arbitrary methods of making this allocation were suggested in the Phillips Hearings.

Phillips suggested separating the dry gas and joint product exploration costs on the basis of net investment in leases of the two types. This division was rejected by the Presiding Examiner because it inappropriately imputed exploration activity to undepleted holdings rather than to need for further exploration. Further, because the gas reserves were relatively less exploited, this method exaggerated the gas element. Phillips wanted to divide the joint product lease portion on the basis of BTU's of gas and petroleum discovered. This approach was also rejected. Oil companies sought economic value and not heat potential, Zwerdling held, and there was if anything an inverse relationship between the physical aspect of the heat value discovered and the economic motivation for exploration.[29]

The exploration allocation method adopted by the Examiner was that termed "Reserves Added Realization." ["RAR"]: ". . . the method which bases the allocation between oil and gas on the relative commercial importance [the valuation at going prices of such additions to reserves] of the additions to their respective reserves through successful exploration over a recent period of time."[30] Exploration cost was

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[29] Ibid., pp. 635-644.

[30] Ibid., p. 653. Quoted from the testimony of Dr. Benjamin Caplan, Eastern Intervenors' witness, Volume 100, p. 13,271 of Hearings.

based on value of reserves discovered, rather than on production sold, for several reasons. For one, it tied the allocation to the desired discovery result expected by the company in so far as the company was successful in accomplishing its goals. It also priced the discovery on the basis of value at the time of discovery rather than on the value at which the sales in the test year were made. Finally, exploration costs were allocated on the basis of results rather than on the basis of the quantity of reserves left from prior exploration. To the extent possible, then, the allocation was made on the basis of marginal factors in company decisions. The "RAR" itself was calculated through relating geological estimates of discoveries over a period of years with a weighted average of appropriate gas field prices.[31]

General administrative costs, the third type of costs to be allocated between gas and non-gas production, were divided on the basis of gross investment. This criterion was chosen on the assumption that company management utilized its time in proportion to the needs for its major service, the care and maintenance of investment.[32]

Gas contract escalation

Phillips had gas purchase contracts with various producers and processors of gas. The price paid by Phillips under these contracts was based on Phillips' resale price. Phillips contended that if it received an increase in the price of gas the escalation clauses in its gas purchase contracts would be triggered. These known changes, the company argued, should be considered in the determination of cost-of-service. In denying this request the Presiding Examiner reminded Phillips that no escalation clauses could take effect without FPC approval. All price changes to Phillips, then, would be based not on "escalation" but on a showing of need. This situation was merely anticipated, not known, and therefore not properly subject to contemplative adjustment. Other gas price adjustments were of a similar type except for those resulting from increased royalties and gathering taxes. These latter adjustments were

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[31] Ibid., pp. 653-659.

[32] Ibid., pp. 626-630.

approved as "known." In summary, any time gas prices to Phillips were actually raised Phillips was free to apply to the Commission for a revision in its rates.[33]

System-wide or production area cost-of-service

Price per unit of gas charged the various gas purchasers depended in part on the method of allocating the cost-of-service among those purchasers. Two alternatives were considered. Cost could be returned from purchasers on an average unit cost basis or adjustments in price reflecting the different actual costs per Mcf in different production areas could be made. These two approaches were termed system-wide rates and area rates, respectively. Whichever alternative was chosen, price was to be adjusted to specific delivery conditions, including gathering costs, delivery pressure, dehydration, and purity.[34]

The area approach was favored by the FPC Staff and most of the intervenors. This group reasoned that old customers should not have to pay for the exploration and development required to serve new customers, who, for the most part, would be receiving gas from high cost areas.[35] One of the intervenors, Eastern, went even further in proposing that any necessary increases in Phillips' rates be accomplished so as to maintain the traditional differences. This procedure would serve not only to reflect gas costs at the time of the contract letting, but would have the effect of maintaining for the future the differences in contract prices due solely to period of origination.[36]

The various area rate proposals were rejected by the Examiner for a series of reasons, any one of which he considered sufficient. The most immediate and practical objection was that area pricing was not possible without extensive additional evidence obtainable only through new hearings. Further delay in completion of the case was considered contrary to the public interest.[37] Further, additional difficult and

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[33] Ibid., pp. 748-758.

[34] Ibid., p. 782.

[35] Ibid., p. 786.

[36] Ibid., pp. 788-791.

[37] Ibid., p. 795.

arbitrary allocations would be required because of the system-wide nature of most costs. The definition of boundaries itself was an almost impossible task. Moreover, area rates, far from fulfilling the Natural Gas Act injunction to eliminate rate discrimination, would perpetuate differences resulting in part from historical accident.[38] A final fatal objection to area rates was that this system would not allow the company to recoup its full cost of service. In newly developed areas of low initial production, for example, gas priced to cover total cost could not be sold. A price that would move gas, on the other hand, would not cover the total cost of production.[39]

On the basis of decisions made on the various issues raised in the Hearings, some of which are reported above, the Presiding Examiner arrived at a cost-of-service for Phillips of $55,870,286. This amounted on an average price per Mcf basis to $0.11375.[40] The issuance of Zwerdling's report marked the conclusion of this phase of the proceedings. The matter was returned to the full Commission for final disposition. The Commission had available to it a transcript of the Hearings, the Presiding Examiner's report, and briefs in answer to the Examiner's Decision filed by Phillips, the Intervenors, and the FPC Staff. The Commission deliberated on the matter until September 28, 1960, at which time it filed the decision to which we now turn.[41]

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[38]The Examiner could have, but did not, remark on the factor of disturbing equity and economic neutrality by maintaining price differentials for identical products. Ibid., pp. 786-787, 795.

[39]Ibid., pp. 785-787, 792-795.

[40]Ibid., pp. 806-807, and Appendix Table 12 of the Examiner's Decision. The "Gross Cost-of-Service" for Phillips was calculated as $57,280,218 or 11.662 cents per Mcf. This gross figure included adjustments for the royalty and gathering tax increases, brought on by the revenue increases allowed, and for the Texas production tax adjustment.

[41]Opinion and Order Determining Cost of Service and Terminating Proceedings, Phillips Petroleum Company, 24 F. P. C. 537 (1960). (Hereinafter referred to as FPC Phillips Decision.) Rehearing denied 24 F. P. C. 1008 (1960). This decision was issued by Commissioners Kykendall, Stueck and Kline, with Kline dissenting in part. Sweeney did not participate and there was one vacancy on the Commission.

The FPC Phillips Decision

The FPC, on the basis of the record in the Phillips proceedings and from experience and study of other cases, rejected the firm by firm cost approach to the regulation of jurisdictional sales by independent producers of natural gas. With regard to Phillips, however, no other type of information was available and therefore cost regulation was used. The views expressed on the cost-of-service issues decided in this context were significant because they reflected the Commission's opinion on problems to be faced with any regulatory method. Of far more effect, of course, was the rejection of traditional regulation in favor of the area-pricing approach. The disagreements with the Presiding Examiner are discussed below in a review of the Commission Opinion.

Phillips cost-of-service

The Commission differed with the Presiding Examiner in the treatment of several cost-of-service issues, but the effect of the differences on balance was small. As compared to Zwerdling's cost-of-service of $55,870,286 or $0.11375 per Mcf, the Commission's cost-of-service based on the same elements was $55,548,054 or $0.11309 per Mcf.[42] The major differences are considered separately below.

Phantom taxes

The Commission accepted the Examiner's rejection of a phantom tax allowance but pointed to different grounds. The Commission held that the courts had ruled tax benefits granted by Congress to specific industries beyond the reach of the Commission.[43] Tax savings were to be treated in this view, however, as a partial return of costs and balanced off against the fair return of the regulated company.

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[42] Ibid., Appendix 10, p. 589. This finding was amended to $55,525,315 or $0.111009 per Mcf in the order denying a rehearing. 24 F. P. C. 1008, 1011.

[43] El Paso Natural Gas Company v. F. P. C., 281 F. 2d 567 (5th Cir. 1960), cited in FPC Phillips Decision, p. 568.

> The Court concluded that there was no statutory authority for the Commission to treat actual savings in taxes any differently than any other savings, that must be passed on to the consuming public. Therefore no amount representing tax benefits or tax savings could be included in the cost of service. The savings were available, the Court said, to make it so much easier for the natural gas producers . . . to earn a fair return.[44]

Since the cost of service and return on investment earned by Phillips was greater than the tax saving, the tax saving had no effect on the amount that Phillips was allowed to recover from its gas sales.

Rate of return on rate-base

The rate of return allowed by the Commission recognized special characteristics in the gas production industry which required differential treatment. While the Commission approved the method used by Zwerdling to determine cost of capital, it decided that no additional rate factor should be utilized. The Commission maintained that it was required to come to a reasonable decision on the basis of all factors. "We must apply our judgment to a multitude of interrelated facts which cannot all be weighed mathematically, but nevertheless we must reach a decision and in doing so shall take such factors into consideration which appear to us relevant."[45] One such factor was the tendency of the investing public to consider inflation, possible discoveries, and non-gas business (which was 94 per cent of the total) in addition to gas earnings estimates. The Commission members decided that they "should not base our findings wholly upon a passing tendency of investors."[46] Two further adjustments were emphasized by the Commission: Phillips, which had most of its capital stock in equity (88.4 per cent), did not need the "cushion" that the usual public utility required; there was additional risk in obtaining the necessary future gas supplies.[47]

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[44] FPC Phillips Decision, p. 568.

[45] Ibid., p. 567. The opinion referred to Bluefield, 262 U.S. 697; S. E. C. v. Chenery Corp., 332 U.S. 194 (1947); and others emphasizing the role of informed judgment in regulation.

[46] Ibid., p. 569.

[47] Ibid., pp. 570-573.

The Commission admitted that any amount of return over cost of capital which it selected would be arbitrary.

> The amount cannot be determined by any formula, and we can conceive of no evidence that would enable us to reach an amount other than by the exercise of our judgment with all the circumstances in mind.
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> . . . . . .
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> In these circumstances we think that an allowance for common equity of approximately 12 per cent would be fair and reasonable.[48]

This rate of return was adjusted to 11 per cent overall by the debt ratio adjustment, as compared to the 10 per cent and 9.25 per cent allowances, respectively, granted by Zwerdling.

Allocation of costs

Major differences in method between the Commission and the Examiner were found in the allocation of costs between gas and other products. The Commission removed unallocated development costs from the production category and allocated them along with exploration costs. The remaining production costs the Commission allocated on the basis of direct operating expenses rather than gross investment as used by Zwerdling.[49]

The Commission allocation of exploration costs rejected the "RAR" method proposed by the Examiner. The reasons given by the Commission for rejecting the "RAR" method were: 1) it allowed liquid prices to influence gas prices; 2) it created some circularity because gas prices depended to some extent on the price of gas; 3) it relied on correlation between the exploration result desired and that experienced, which could yield incongruous results in the short run; and 4) it required estimates of reserves discovered which were difficult to make and which exhibited instability over time.[50]

Several premises influenced the FPC choice of allocation method. Industry factors, the Commission noted, should be considered in allocating costs. The Commission argued that the rising relative importance of

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[48] Ibid., pp. 573, 574.

[49] Ibid., pp. 553-555.

[50] Ibid., p. 557.

gas required correlative gas responsibility for exploration. The bias toward gas discovery in the trend to deeper drilling also pointed to greater gas participation in exploration costs. Finally, higher gas prices would bring high gas development, and as a corollary, greater gas discovery should reflect the additional expenditure on production development.

A physical measure of the relative amount of gas discovered was essential for establishing some measure of response to exploration and development stimuli. BTU content, the Commission decided, was the only measure available. This judgment was expressed in the passage:

> . . . it is appropriate that the changing outputs of each product should bear the changing exploration costs in proportion to the contribution that such costs make to each supply, and it is necessary for currently produced gas to bear an increased proportion of the joint exploration costs and development leases if the growing gas demands are to be supplied on a continuing basis.[51]

The BTU method chosen by the Commission was not the same method advocated by Phillips because it contained an adjustment for the differing economic values of a BTU in gaseous and liquid form. Over time, the price of a BTU in gas had risen compared to the price of a BTU in the liquid form. In 1958 the price was about twenty-four for oil to one for gas. The FPC, while maintaining that there had been no recourse to any sort of formula, came to the conclusion that six Mcf of gas discovered should, for cost allocation purposes, be equal to a barrel of oil.[52] When measured in relative BTU's this was the same ratio that held between prices of gas and of oil. The Commission method of allocation, which boiled down essentially to a back-door "RAR" method, resulted in an allocation of 32.74 per cent of the exploration and development costs to gas, as compared with the Examiner's allocation of 30.46 per cent and Phillips' contention for 61.88 per cent.[53]

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[51] Ibid., p. 560.

[52] Ibid., pp. 560-561.

[53] Ibid., p. 561 and Examiner's Decision, pp. 653, 636.

Gas contract escalation

The Commission agreed with Phillips that recovery of its increase in costs, because of automatic escalation clauses in some of its gas purchase contracts, should be allowed. The Commission pointed out that the contracts were written so that the producer received a stated per cent of the final sale price of gas that was stripped in Phillips' gas plants. These contracts were not filed with the FPC as a matter of FPC policy. They did not involve a rate but merely a distribution among producers. The FPC ruled that it would not have jurisdiction over the higher gas cost to Phillips which would automatically follow a price increase. Phillips therefore was entitled to recover the higher cost-of-service resulting.[54]

Rates to be charged purchasers

The FPC did not specify rates in the proceedings. The Commission held that for the future it was going to rely on the area-pricing method for setting producer rates and that this method would be applicable to Phillips. Since the total cost-of-service determined for Phillips was greater than Phillips' gas revenue, there were no refunds due purchasers as a group. The lack of evidence of significant discrimination among Phillips' rates led to the conclusion that allocation of Phillips' cost-of-service among the various purchasers would show rate deficiencies for the test years in all cases. Since it was impossible to grant Phillips retroactive rate increases, the Commission saw no reason for going to the expense and effort of establishing test year rates. The FPC further suggested that upon the proper motion all rate suspensions prior to 1959 would probably be dismissed because the study demonstrated that prices appeared to be less than the cost-of-service through 1958. Rate changes filed afterr 1958 were to be studied and acted upon by the Commission.[55]

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[54] FPC Phillips Decision, p. 551.

[55] Ibid., pp. 575-578.

FPC rejection of public-utility regulation of independent producers

The Commission rejected the traditional public-utility method of regulating the rates of independent producers for several major reasons. The first of these was that the independent producer differed from the usual public utility in ways significant to the regulatory process. "Producers of natural gas cannot, by any stretch of the imagination, be properly classified as traditional public utilities."[56] In making this point the Commission contrasted the independent producer with the regulated interstate pipeline. The interstate pipeline has some assurance of the financial feasibility of any project begun because studies are made prior to investment to determine sales potential, probable cost of gas, availability of supplies, etc. Construction starts only after FPC certification and usually after specification of rates. Uncertainty is virtually removed for the pipeline because the relevant variables are either determinable or controllable. The prospective independent producer, however, faces considerable uncertainty. Investment is made without knowing whether or not there will be production. If there is production, the price received by the producer is unknown. Hence the pipeline fits the stable picture of the public utility image, but the producer, in important aspects does not.[57]

The nature of the regulatory problem presented by the independent producer is different from that offered by traditional public utilities. In pipeline regulation, for example, cost-of-service and value to the consumer are directly related to investment. The technology and equipment used are relatively stabilized, have a market determined price, and a determinable expected life. The gas production industry exhibits none of these qualities. The value of an individual gas reservoir is not meaningfully related to cost of discovery and development. Joint product allocation and evaluation problems are far greater than the range of difficulty encountered in similar adjustments in other regulated industries. Allocation and estimating decisions in nonproducer

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[56] Ibid., p. 542.

[57] Ibid., p. 543.

regulation are usually of minor importance, but in independent producer regulation these are large enough to create either vast windfall profits or bankruptcy. The Commission concluded that the differences between traditional public utility operation and natural gas production were of such a nature that refinement in procedures and methods would only give an appearance of accuracy and certitude: the substantial problems of such regulation would remain intact.[58]

Traditional regulatory methods, when transferred to the natural gas industry, also gave both incongruous and undesirable results, according to the FPC. The heart of public-utility regulation is price based on costs. These costs, because of the nature of most public utility operations, are rather easily discerned and provide a measure of the quality of utility management. Gas production, and especially its exploration and development phases, is such that only very close scrutiny could detect the difference between apparently good and poor management. High costs to the firm, then, might be the result either of unavoidable conditions or of bad management. Cost determination of price would isolate the company from most cost pressure and would reward the inefficient and incompetent as much as the prudent and wise. In addition, cost-determined price would reward the timid, slow, and parasitic as much or more than the pioneering firm which extended the zones of production. The company which opened up a new production area would receive no reward for its initiative because its investment base would show a low value for the producing property. The company which bought reserves in a proved area at no risk would be entitled to recover its full cost from the inflated mineral values purchased.[59]

A similar incongruous result would follow for royalty owners. If the price at which natural gas were sold for resale in the field depended on the cost-of-service, then the royalty owner would be well advised to seek out the most inefficient producer to develop the reservoir. The inefficiency and resulting high cost would bring a higher price but no offsetting higher cost to the royalty owner. This result, the Commission held, was clearly inconsistent with public welfare.[60]

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[58]Ibid., p. 543-544. [59]Ibid., p. 543. [60]Ibid., p. 544.

Under cost-of-service based regulation the producer would have an incentive to concentrate his high cost gas in interstate commerce to the detriment of public welfare. In regulated interstate service the producer would receive a cost covering price whether that cost was higher or lower than the average cost of all gas sold. If the producer held his low cost gas for the unregulated intrastate market he could charge whatever the market would bear and receive as gross margin the difference between cost and market price. This arrangement would possibly distort the gas market, therefore increasing total social costs and would also artificially raise price to interstate consumers.[61]

The administrative difficulties of cost-of-service producer regulation were, even if no other problems existed, enough to doom the method in the Commission's view. According to Commission judgment, the rate-base method would require cost-of-service and rate studies on every producer of natural gas. This number included not only the 3,372 companies which had filed rates with the Commission but also the 5,435 nonfiling co-owners whose rights would have to be considered. As of September 28, 1960, there were 11,091 rates and 33,231 supplements to rates on file at the Commission awaiting decision. The Commission decided that it would be impossible, as a practical matter, to make cost-of-service studies on each of these companies, especially since several studies would probably be required each year. On this administrative problem the Commission concluded that: ". . . effective regulation of the price of natural gas must be on some more manageable plan that [sic] the rate base method."[62]

In reviewing its experience with the rate-base method the Commission found that the cost-of-service derived from a traditional study was higher than the actual proposed prices in every case decided. ". . . regulation of producers on a company-by-company rate base method will in all probability result in higher consumer prices than we would otherwise have."[63] Cost-of-service would in some cases, the Commission

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[61] Ibid., p. 545.

[62] Ibid., pp. 545-547.

[63] Ibid., p. 546. In a footnote the Commission notes the exception of the Panhandle-Hugoton field which was developed early, produces from shallow horizons, and has tremendous reserves.

found, price gas out of the market. Moreover, in the studies that were conducted, it was shown that the contracts in existence on June 7, 1954, were at prices less than the cost-of-service and showed no unfair discrimination. The Commission concluded, then, that: "Since the cost rate base method seems almost always to produce the higher rates it appears that consumers, in most instances, will be thoroughly protected if we place more reliance on existing prices and on applicable economic principles."[64]

The final dismissal of the Phillips case, after the usual appeals, marked the end of the six year attempt to regulate independent producers on a cost-of-service basis. From this time on regulation was to be based on a different method. An examination of the approach proposed by the FPC, the area-price method, is delayed to Chapter VIII below. An analysis of the public-utility approach to independent producer regulation in terms of the goals of regulatory policy follows.

Public-Utility Regulation as a Means of Fulfilling Public Policy Goals in the Field Sales of Natural Gas

The public-utility approach to the regulation of the independent producer was rejected by the FPC as a basis for the regulation of independent producers. In its rejection the FPC considered both administrative and policy objections to this method. This study concentrates on matters beyond the administrative issues of tax treatment, cost allocation, and appropriate rate of return. Its focus is on whether, abstracting from administrative questions, the public-utility approach to independent producer regulation can fulfill selected public policy goals.

The three public policy goals for the production portion of the natural gas industry were formulated in Chapter VI above as the promotion of maximum economic welfare, an appropriate income distribution, and the furthering of the national interest in gas use. Content was not specified for any of these goals but rather was left for decision

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[64] Ibid.

by the appropriate valuing agency of the society. The purpose of this study was limited to determining whether the proposed regulatory method was capable of fulfilling the goals of public policy, abstracting from specific content and from administrative problems. An examination of the ability of the public-utility approach to meet these criteria is presented below. In order to isolate the approach from all external influences the rest of the regulatory framework was assumed to remain as it was described to be in Chapter III.

The Public-Utility Approach and the Promotion of Maximum Economic Welfare

Maximum economic welfare, following the extended discussion in Chapter VI above, is defined as the provision of the greatest possible number of satisfactions to individuals by actions which do not achieve benefits to some at the expense of others. Changes in the distribution of income are avoided and maximization is sought given the existing income distribution. The sole criterion for determinable maximum economic welfare is the optimal allocation of available resources as determined by individual choice. In the natural gas production industry two basic allocation problems exist. The first of these is the allocation of productive factors, and the second is the allocation of natural gas among alternative uses. Part of the regulatory potential of the public-utility approach depends on its success in providing welfare maximizing solutions to these allocation problems.

Allocation of productive factors

The use of the public-utility regulation method in the natural gas production industry guarantees the producer the opportunity to recover the costs required to bring gas under control and to prepare it for shipment to the ultimate consumer. The producer is not free of cost pressure because the elasticity of the demand for gas, limited though it is in the short run, does restrict the opportunities to shift the cost burden on to consumers. Nevertheless, the producing company, within certain ranges, is isolated from most of the discipline of a

market-determined price for its nonindustrial, jurisdictional sales if public-utility regulation is used. As a consequence, the producing firm does not have the efficiency incentive it would have if there were no limit to the gains or losses which it could sustain. The potential for passing the costs of inefficiency on to consumers is not nearly so great in other industries where the public-utility method of regulation is commonplace. These industries, for example gas transportation and distribution and electric generation and transmission, for the most part are highly repetitive and routinized in their operations. Little opportunity for the exercise of significant managerial discretion exists. Moreover, operations are essentially similar among firms in the same industry. Any significant departure from expected costs can be traced and managerial performance judged. While the record of rate regulation has been far from satisfactory, expert regulatory agencies have a better chance of protecting the consumers from exploitation and managerial inefficiency in the presence of the traditional conditions than in their absence. For this reason, in the natural gas production industry public-utility type regulation does not successfully substitute social control for the spur of profit maximization provided by the sanctions and incentives offered by market direction.

Research, exploration and development effects

The lack of a direct and full profit response to successful ventures leads to a reduction in the incentive of the independent producer to pioneer new developments. The resulting drop in developmental expenditure lessens the possibility for discoveries which would increase industry productivity and bring gains to consumers. Any research, exploration, or development expenditure might fail to return its cost to the individual firm, even if the actuarial expectation for the industry as a whole were almost certainly positive. Under public-utility regulation the individual firm is legally allowed to charge a rate designed to enable it to cover costs and earn a reasonable return on investment. If no commodity is produced, or if costs are such that the legal rate exceeds the rate at which the commodity will be purchased,

the firm cannot recover its costs. The firm faces a risk, then, that certain research, exploration, and development expenditures will not be recoverable and will serve to reduce the net worth of the firm. This risk is very much greater in the natural gas production industry than it is in the industries where regulation by the public-utility method was developed.

In the absence of regulation the risks of loss would be counterbalanced by opportunities for supra-normal gain from successful expenditures. Under firm by firm, cost-based regulation, however, a ceiling is placed on return from successful ventures but there is no floor under losses from unsuccessful ones.[65] Under public-utility regulation, then, on theoretical grounds one would expect the firm to engage in less research than would be expected under free market operation. Similarly, exploration is prejudiced in areas where, with a higher level of uncertainty, low cost natural gas reserves might be found. The welfare consequences of the bias given to the "quiet life" are considerably more severe for the natural gas production industry than for the more common public utilities. The greater opportunity for cost reduction, especially through exploration, makes the cost of managerial inertia more significant for the consumers of natural gas than for the consumers, say, of electric energy.

Jurisdictional and nonjurisdictional effects

The public-utility method of regulation of the natural gas industry could be expected to reduce the efficiency of the allocation of resources because it would create an incentive to treat jurisdictional and nonjurisdictional phases of a natural gas company's operations differently. Under cost-based regulation the firm is encouraged to associate the largest possible portion of its costs with jurisdictional sales. To the extent that the company would substitute uneconomic

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[65] This is the same practical argument for system-wide rates rather than those reflecting experiences in each production area which Zwerdling raised in the Examiner's Decision, p. 785. See above.

methods for more economic methods in order to accomplish this end, waste would be encouraged by cost-based regulation of sales price. The same results would follow from company profit-maximizing decisions between sales outlets. Gas which had a high book cost of production would be shunted into the interstate market for jurisdictional sale, while low cost gas would be sold where there was no price regulation. In interstate commerce the legal margin between sale price and cost would be the same for low cost gas as for high cost gas. If the firm were unable to cover the cost of some portion of the gas sold interstate the loss incurred would justify a higher return on other jurisdictional operations. Use of low cost gas intrastate would make possible a larger gross margin in the market-directed portion of the firm's operations. The result is that the net return on the sum of jurisdictional and non-jurisdictional operations might be increased by dedicating high cost gas to interstate commerce, even though this led to a higher total cost of production. To the extent that the more efficient resource allocation is rejected for the more profitable there is a greater use of resources than would otherwise be required for the same output measured in physical terms. Cost-based regulation would to this extent lower economic welfare.

Backward-looking resource allocation

The final reason that the public-utility approach reduces economic welfare through inefficient use of resources is that this approach forces management to look backward to historical costs rather than forward to alternatives. Social costs at any point in time can only be measured in terms of alternatives. Alternatives foregone, because decisions have already been reached, are not socially relevant because nothing can be done about them. When price and service conditions are set on the basis of costs that have been incurred in the past not only are commodities allocated in ways which only coincidentally reflect the social costs of given uses but the criteria on which new decisions are made are altered as well. Expectations are not allowed to play their full role because the individual firm knows that present expenditures

will establish the future price allowances, just as present sales terms were conditioned by prior expenditures. Under these circumstances the results of privately maximizing decisions can diverge significantly from the optimum measured in social terms.

Allocation among current alternative uses

Maximum welfare from natural gas depends not only on regulation which promotes maximum efficiency in the use of productive factors (inputs), but also on the use of the commodity produced in a manner which yields the greatest consumer satisfaction measured in individual terms (outputs). One criterion by which the public-utility method must be judged, then, is the efficiency in consumption to which it leads. If the gas produced is distributed in such a way that, abstracting from transportation and distribution costs, no consumers receive gas at a price at which nonconsumers would purchase it, it is allocated appropriately. In other words, the criterion is satisfied if the priority of use assumed by the common utility function is not violated by gas going to low value uses while it is priced away from higher value ones.

The biases in the cost-based method which push high cost gas to jurisdictional markets would reduce economic welfare if this method were used. Jurisdictional sales would be made at rates higher than those which would reflect the necessary social costs of providing the commodity. At the same time, the nonjurisdictional rates would not cover the total social costs of such service. Hence the use of resources would not reflect true social costs and therefore would not balance resource use on the basis of marginal social benefits and marginal social costs in alternate ends. Such violations of optimum conditions could be expected even in the absence of further regulatory problems.

The cost of gas at the wellhead varies with any number of conditions, almost none of which are in any way relevant to the ultimate consumer. The variation in the cost of gas from field to field and from dedication period to dedication period is considerable, both absolutely and in comparison with the variations in prices of other identical

commodities at any given point in time. These variations in large part do not reflect social costs of alternative use of resources. Under the public-utility approach the price of gas to the consumers reflects these costs. These differences in price are meaningless as an indication of the welfare maximizing allocation of the commodity. Some gas is therefore consumed in uses which yield less utility than other uses where gas is excluded because of its price. If less gas were used in the former activity and more in the latter there would be a net increase in individual satisfactions which could conceptually make some better off and none worse off. Hence the public-utility approach to producer regulation does not fulfill the criterion of maximizing economic welfare on either the production or the consumption sides of the market.

The Public-Utility Approach and the Distribution of Income

The public-utility approach to the regulation of the field price of natural gas is basically a method designed to adjust the distribution of income between the producing and consuming sectors of the economy. Control over this distribution is one of the goals of producer regulation. Regulation of the sale of gas for resale in interstate commerce by means of the public-utility approach in theory maintains the status of the producer so that engaging in this activity yields a "fair" return, but no more than that amount.[66] Variation of the amount of return considered "fair" makes it possible for the regulators to use the public-utility approach to alter the distribution of income between the producers and the consumers of natural gas in response to changes in external conditions or changes in concepts of what the distribution of income should be. This method, while flexible enough to express the consensus at the industry level, is not capable of differentiating between particularly deserving (on the basis of efficiency) producers. In general, then, the public-utility approach is capable of altering the

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[66]Restrictions of space prevented inclusion in this study of a discussion of the evolution of social regulation of business which, in one of its sections, traced the similarities between the doctrines of just price and the public-utility concept of regulation.

distribution of income among producers and consumers as groups, if non-monetary gains and losses are ignored.

The Public-Utility Approach and Natural Gas Use In the National Interest

The national interest, as it has been considered in this work, is centered on the allocation of natural gas over time in the interest of the long term continuity of the economy of the United States. It is recognized that selection of a policy toward the natural gas industry that would conform to the national interest requires balancing several different elements. Gas use rates over time, geographical distribution of production and consumption, and policies toward the development of alternative fuels are all aspects of such a policy. Selection of the details of such a policy is not attempted here. The question at issue is whether the public-utility approach to regulation can provide a suitable framework for furthering the national interest in the natural gas production industry, whatever the content of that interest. The discussion that follows concentrates on the allocation of natural gas reserves over time. Two associated factors affect the allocation of gas. The first of these is the speed with which the known and determinable reserves are produced and utilized. The other influence on the availability of natural gas over time is the proportion of the existing gas reserves which are known and deliverable.

The public-utility approach to regulation establishes price on the basis of cost of production. The price of gas in the field becomes a part of the price of gas in its ultimate use. The amount of the known and deliverable supply of gas consumed is influenced by the price charged for the gas. Since the public-utility approach sets the field price of gas on the basis of historical cost of production to the firm there is no opportunity for the social value of a preferred allocation of gas over time to make its influence felt. Therefore there is no way for the national interest in gas availability to be expressed directly through this sort of regulation.

The quantity of gas in the earth is not, of course, the amount of gas which is relevant to national policy. Only that gas which is effectively known and economically producible is of economic importance. The knowledge of natural gas reserves, necessary to rational development of a use-rate policy, depends in large part on the actual discovery process. One factor important to rational public policy toward the gas industry, then, is encouragement of expenditures which both yield information and prove-up gas reserves for future production. Such a program of incentives cannot be fitted into the public-utility mold. Thus, in this particular the national interest cannot be served. The public-utility method is not capable of putting a policy decision into effect unless the desired results flow from the regulatory formula. Income distribution alteration fits this criterion, but regulation cognizant of use rate issues does not. No opportunity exists for the volitional policy changes which would be required to express the social interest in gas use decisions.

The public-utility formula for regulation is also inflexible in its operation. Effective regulation in the national interest requires adjustment to changing conditions. One example of a change which would require policy alterations would be a breakthrough in the development of successful substitutes for the energy provided by natural gas. If such were to occur, natural gas would have to be used at a rate consistent with a far lower future evaluation of it if the reserves were to make their maximum contribution to national welfare. The impact of the reduction in the future value of natural gas would be exerted almost entirely on the most immobile factor, the gas in the field. Under public-utility regulation, however, the price in the field would continue to be based on historical cost of production. In turn, the maintenance of the higher price would bring the substitute commodity into the market far more rapidly than the national interest would indicate. Hence the useful life of the service facilities would be unnecessarily shortened by the continued emphasis on past sunk costs. This is one example of why the inflexibility of the public-utility approach makes it unsuitable

as a tool to achieve the national interest because it focuses on factors which are not important to efficient resource allocation.

The Public-Utility Approach and the Social Welfare Function

The preceding sections have examined the ability of the public-utility approach to gas producer regulation to fulfill the goals of efficiency, equity, and the national interest. These various goals cannot be achieved independent of one another but rather must be weighed and balanced for joint attainment. Public-utility oriented regulation is incapable of providing this balance. The rate of return is the only decision factor which is not fixed or pre-determined when regulation is tied to historical cost. While this factor would influence both the distribution of income and the use rate of gas over time, only coincidentally would a rate satisfying one criterion simultaneously satisfy the other. Within the limits of the cost-based approach there exists no way of interweaving multidimensional welfare maximizing regulation.

The public-utility approach, perhaps most seriously, provides a quantified answer according to a formula which only hides and hinders the process necessary for development of a self-validating social welfare function of the sort discussed in the last section of Chapter VI. Only a few elements are accepted as germane in public-utility regulation. The limited and specified number of these preclude the feedback essential to the modification of policies. Only through the modification of regulation in the light of experience can a program more in keeping with the wishes of the public be built. Similarly, a public which accepts as its own the policies and the values expressed in the regulation develops only when these modifications can take place. For these reasons the public-utility method is not able to achieve a satisfactory amalgam of the three basic public policy goals.

Cost-based Regulation in Perspective

When the Federal Power Commission initiated regulation of the sale of gas for resale by independent producers it was natural for it to turn to the public-utility method with which it was familiar. Even from the beginning, however, this type of regulation was opposed by many in the natural gas industry and by some of the regulators themselves. The opposition focused its primary attention on removing FPC jurisdiction from the industry. It was not until several years after the Phillips decision that serious consideration was given to the actual mechanics of regulation. Examiner Zwerdling, the FPC Staff, and the other participants in the Phillips hearing used the firm by firm, cost format. The Examiner upheld the public-utility approach in his decision and utilized it to determine an appropriate cost-of-service and rate of return.

The FPC, charged with the responsibility for both a wise and a tenable decision, concluded that the public-utility method was not satisfactory for the industry. The reasons given for this conclusion paralleled to some extent the findings of the present study that the method was inherently unsuitable for regulation of the independent producers in the public interest.

The public-utility approach was the focus of regulatory interest between the Phillips decision of 1954 and 1960. While partisans of the public-utility approach remain, interest has shifted to the area-pricing technique and its implications. This study now turns first to describe the area-pricing approach and then to evaluate it in terms of the goals of regulatory policy.

CHAPTER VIII

REGULATION OF THE INDEPENDENT PRODUCERS OF NATURAL GAS BY THE AREA-PRICE METHOD

The area-price method of regulating the independent producers of natural gas was instituted by the FPC Area-Pricing Statement issued September 28, 1960. This statement launched regulation in an entirely different direction and on a different tack than the traditional cost-based, firm by firm procedures with which the FPC was familiar. Two basic changes resulted from the switch to the area approach: Gas was treated as a commodity rather than as a service performed by a given firm; regulation was freed to look forward to the public interest rather than restricted to adjustments to past events. The implications of these basic changes are considered in this chapter.

The area-price proposal advanced by the FPC has had, at the time of this writing, something over two years existence.[1] There has been some clarification of the administrative process during this time, but few elements of area-price regulation can be considered settled public policy. The precedent making area-price decision, when it comes, will almost certainly be appealed to the courts.[2] Whatever the Court

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[1] Fall, 1962.

[2] The FPC Phillips Decision (24 F. P. C. 537; 24 F. P. C. 1608) was appealed to the Court of Appeals, District of Columbia which upheld the Commission in a decision issued November 30, 1961 (303 F. 2d 380). Wisconsin, among others, appealed the Circuit Court decision to the Supreme Court which granted certiorari in May, 1962 (369 U.S. 870). Arguments were held during the October Term, 1962. The Supreme Court rendered its decision on May 20, 1963, upholding (as obiter dicta) the right of the FPC to attempt to develop the area-price method of regulation, Wisconsin v. Federal Power Commission, 83 S.Ct. 1266, 1274-1275 (1963). The decision was split five and four, with Justice Harlan speaking for the Court and Justice Clark, joined by Justices Warren, Black, and Brennan, writing the dissent.

decision on the area-price method, it will concern only the authority of the FPC under the present statute. If the challenge to the method is upheld by the Supreme Court it could still be enacted through Congressional amendment of the Natural Gas Act. While no conclusions can be drawn as to the specific shape of area-pricing under the current legislation, analysis of issues and alternatives can proceed based on the essence of the approach.

The area-price approach to independent producer regulation under the FPC treats all the gas produced by independent producers in a certain geographical area as a commodity and sets a price on that commodity. Under this regulation all firms in the area are limited to no more than the area-price for the gas, with specified adjustments, whatever their individual cost or revenue positions. Any contract which embodies a price and other delivery conditions equal to or below the price and conditions set in the area is approved automatically by the FPC. The area-price under present FPC treatment is, then, a ceiling beyond which contract prices cannot go, though it is not similarly a floor. The integrated producers of natural gas are regulated under the traditional public-utility determinations of their cost-of-service plus return on prudent investment dedicated to public service.

Independent producer regulation since the Area-Pricing Statement has moved toward the establishment of permanent area-price guidelines. The major developments in this effort by the FPC are mentioned below to serve as an administrative background for analysis of the proposals themselves. The major issues in area-price regulation are also analyzed. The specific public policy evaluation of the area rate approach abstracts from administrative technique because of the undetermined nature of the approach as it will finally evolve from the FPC procedures and the courts. For this reason certain assumptions are made as to the application of the policy. For example, it is assumed in this portion of the study that the area-price is both a ceiling and a floor, and that all production either comes under area-price regulation or is consistent with it. Evaluation based on these assumptions leads to certain conclusions on the use of this method. These are reported in the last section below.

Major Developments in the Regulation of Independent Producers by the Area-Price Method

The Area-Pricing Statement included in its first paragraph these sentences indicating its purpose:

> By this statement and the appended area price schedules we will set standards for initial and increased rate filings by producers for the sale of natural gas into interested [sic] commerce. These standards will serve as a guide to us and to interested parties in determining whether proposed initial rates should be certificated without a price condition and whether proposed rate changes should be accepted or suspended.[3]

The Commission said at another point: "In our opinion, the price standards established by this statement will aid in effectively applying the provisions of the Act to independent producers on a simple, clear, and administratively feasible basis, and in a manner fair to all whose interests are affected by Commission regulation."[4] With this pronouncement the Commission began its attempt to develop a legal and administratively feasible means of applying the Natural Gas Act to independent producers.

Temporary Areas and Prices Established in the Area-Pricing Statement

The geographical areas used by the Commission were selected on grounds of convenience and administrative ease. The choices were not explicitly defended by the FPC, nor were the criteria for these choices made known. The Commission noted that the areas delineated might not coincide with economic factors relevant to producer regulation. It suggested the possibility of boundary changes to remedy any inequities which developed in the course of regulation.[5]

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[3] Area-Pricing Statement, 24 F. P. C. 818.

[4] Ibid., p. 819.

[5] Ibid. The areas chosen are noted in Table 2.

The Commission did not specify the method by which it arrived at the prices published in the original area-pricing statement. More importantly, it did not make clear the goals pursued in establishing these prices or the industry results expected from the prices set. The following, in fact, was the total reference to the level of prices:

> In arriving at the price levels for the various areas set forth in the appendix to this statement, we have considered all of the relevant facts available to us. Such consideration included cost information from all decided and pending cases, existing and historical price structures, volumes of production, trends in production, price trends in the various areas over a number of years, trends in exploration and development, trends in demand, and the available markets for the gas.[6]

The Commission order referred to prices for pipeline quality gas. Adjustments for quality differentials were to be made on a case by case basis until general rules could be formulated. A temporary two-price system was set up with initial prices above those for price increases under old contracts. These differences in price were required, according to the Commission, because economic conditions in the newly discovered and the established reservoirs were not the same.[7] Table 2, adapted from Appendix A of the Area-Pricing Statement, gives the prices originally set by the Commission.

The areas and area prices presented in the Area-Pricing Statement had no force in themselves because they had not been developed through the usual FPC procedures and had not received the sanction of due process. These prices were designed as temporary guidelines for the Commissioners, the FPC Staff, the industry, and consumers. A passage from the Area-Pricing Statement itself makes this point clear.

> For the present, and in the absence of compelling evidence calling for other action by us, proposed initial sales of natural gas by independent producers which include rates higher than those indicated in the appendix attached to this statement shall be denied a certificate or certificated only upon the condition that lower rates be filed, and all rate changes filed under existing contracts which call for a rate exceeding the indicated price level in the attached appendix to this statement shall be suspended.[8]

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[6] Ibid. [7] Ibid. [8] Ibid., p. 820.

TABLE 2

AREA PRICE LEVELS FOR NATURAL GAS SALES BY INDEPENDENT PRODUCERS[a]

(All Rates at 14.65 Psia)

Area	Initial Service Rates Per Mcf	Increased Rates Per Mcf
Texas:		
District No. 1	15.0 cents	14.0 cents
District No. 2	18.0 cents	14.0 cents
District No. 3	18.0 cents	14.0 cents
District No. 4	18.0 cents	14.0 cents
District No. 5	14.0 cents	14.0 cents
District No. 6	15.0 cents	14.0 cents
District No. 7-b	14.0 cents	11.0 cents
District No. 7-c	16.0 cents	11.0 cents
District No. 8	16.0 cents	11.0 cents
District No. 9	14.0 cents	14.0 cents
District No. 10	17.0 cents	11.0 cents
Louisiana:		
Southern	Not determined	13.7 cents
Northern	16.6 cents	13.7 cents
Mississippi	Not determined	13.7 cents
Oklahoma:		
Panhandle area	17.0 cents	11.0 cents
Other	15.0 cents	11.0 cents
Carter-Knox	16.8 cents	11.0 cents
Kansas	16.0 cents	11.0 cents
New Mexico:		
Permian Basin	16.0 cents	11.0 cents
San Juan Basin	12.7 cents	12.7 cents
Colorado	14.6 cents	12.7 cents
Wyoming	15.0 cents	12.7 cents
West Virginia	26.8 cents	23.9 cents

[a]Adapted from Appendix A, "Area price levels for natural gas sales by independent producers," Area-Pricing Statement, 24 F. P. C. 818, 820.

The Commission stated that exceptions to the guidelines would not be considered on an individual producer basis. Instead, industry and area data would be used to determine whether the area ceilings or the area boundaries were unsatisfactory. The Commission thus decided to regulate the commodity within an area rather than individual firms. Changes in gas prices, following the proposed area-price method, would only be made as amendments to the area-price levels. No individual company exceptions were to be allowed. The Commission requested that interests seeking to challenge rates or area boundaries bring the proceedings with other parties with the same interests in order to expedite and simplify the administration of gas regulation.

Permanent Regulation Using the Area-Price Method

The Commission moved rather rapidly to start proceedings to determine permanent specific area prices. The area chosen for the first rate determinations consisted of the Permian Basin of New Mexico (from which the common name of the proceeding was taken) and Texas Railroad Commission Districts 7-c and 8.[9] The preliminary rate for each of these areas was identical. A prehearing conference was convened under the direction of FPC Chief Examiner Edward B. Marsh to "consider the type of evidence to be adduced, the order of presentation, the simplification and delineation of the issues, and the number of witnesses to be heard on any issue or subject."[10] The results of the prehearing conference were meager in terms of agreements, but some observers reported that there was at least an airing of important issues. The conference broke up prior to its expected date. One of the questions in dispute was whether cost-of-service data was to be required from individual producers. Another prehearing conference was scheduled for Washington in the hope that some decision on the cost-of-service data question

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[9] Area Rate Proceeding, Docket No. AR61-1; Claude E. Aikman, Docket No. G-18466; North Central Oil Corporation (Operator), Docket No. CI60-435. Order Instituting Area Rate Hearing, Consolidating Proceedings and Prescribing Preliminary Procedure, 24 F. P. C. 1121 (1960).

[10] Ibid., p. 1123.

would be settled by the Commission itself, opening further ground for progress in conference.[11]

Two issues came before the FPC from the Midland prehearing conference on Permian Basin rates. The first of these was the distinction between cost data, which the FPC had suggested as relevant to area-price determinations, and cost-of-service data. The second was the admissibility of a "savings clause" which would allow a producer to show in an individual presentation that the rates suggested by him were reasonable though they were higher than the established area rates. The FPC ruled out cost-of-service data both for individual producers and for the producers as a group. The Commission maintained, however, that overall cost statistics were essential. It suggested that these data be compiled and presented in the aggregate. The Commission deferred ruling on the "savings clause." It noted, however, that any attempt on the part of an individual company to show the reasonableness of its rates could not be based on a cost-of-service presentation because what it ruled out for the area proceedings it certainly would not allow by an individual company.[12]

The Washington continuation of the Permian Basin prehearing conference began on April 12, 1961, after the Commission's position on cost-of-service information had been made known. A representative committee was formed to explore possible courses of action because of the complexity of the subject matter and the unwieldiness of the full conference. The smaller group failed to make significant headway and the meetings recessed on the afternoon of April 13, 1961.[13] Later a

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[11]"First Round in Area Pricing Is a Draw," Oil and Gas Journal, LIX, No. 9 (March 13, 1961), p. 84.

[12]Area Rate Proceeding, Docket No. AR61-1; Claude E. Aikman, Docket No. G-18466; North Central Oil Corporation (Operator), Docket No. CI60-435. Order Ruling Upon Motion Relating To Evidence to Be Considered in Area Rate Proceeding, 25 F. P. C. 614 (1961).

[13]"Area Pricing Ground Rules Are Tough to Write," Oil and Gas Journal, LIX, No. 16 (April 17, 1961), p. 86.

formal prehearing conference was held to read into the record the decisions reached. There was, of course, little to read in.[14]

The FPC initiated another area rate study, this one covering Southern Louisiana, before Examiner Marsh submitted his report on the Permian Basin prehearing conference. The Southern Louisiana hearing was carried along with the Permian Basin study in order to gain concurrent experience with two distinct producing regions. It was hoped that area-based regulation would be expedited by dual studies without the drain on the FPC resources which would have occurred with further duplication. The Southern Louisiana area was chosen because of its current and future importance as a gas supply region.[15]

The first prehearing conference session for the South Louisiana region opened on June 26, 1961, in Baton Rouge, Louisiana, with Chief Examiner Marsh again in charge. In this proceeding the prehearing conference was limited to consideration of issues surrounding rates for initial sales, with the rates for increases under old contracts left to a later study. No initial rates for Southern Louisiana had been set by the Commission in its Area-Pricing Statement because of pending litigation.[16] The affected parties in South Louisiana were far apart in their ideas of appropriate rates for new gas contracts and of procedures for determining such rates. In an attempt to achieve some agreement, Marsh appointed a representative committee to negotiate informally just as he had done in the Permian proceedings. The conference recessed with the steering committee unable to resolve the differences which kept its members apart. Another steering committee meeting was scheduled

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[14]"Area-Pricing Talks Fizzle," Oil and Gas Journal, LIX, No. 17 (April 24, 1961), p. 82. Examiner Marsh filed his report to the FPC on the prehearing conference on May 26, 1961.

[15]Area Rate Proceeding, Docket No. AR61-2; Aladdin Exploration Company, Inc., Docket No. CI61-1564; Amerada Petroleum Corporation, Docket No. RI60-18. Order Instituting Rate Proceeding for the Southern Louisiana Area, Consolidating Proceedings and Prescribing Preliminary Procedure, 25 F. P. C. 942, 942-943 (1961).

[16]Ibid., pp. 944-945.

for July 11, 1961, to make another try for a consensus before the second round of prehearing conference sessions.[17]

Examiner Marsh circulated his preliminary report on the prehearing conference to the participants after the adjournment of the August sessions in Washington. This report, as reviewed in the Oil and Gas Journal, recommended abandonment of the area-price approach. Marsh raised two objections: first, the plan was not acceptable under the Natural Gas Act, and second, even if it were legal, it was unworkable in practice. He noted that some of the participants in any proceeding would be unwilling to abide with any area price set. These participants would then appeal using cost evidence in an attempt to overthrow the decision. If such appeals were permitted, producer rate determination would be back at the case by case level and no procedural gains would have been made by adopting the area approach.[18] Marsh apparently believed that denial of individual showings of reasonableness of rates was unconstitutional in that it violated the due process provision protecting property from confiscation.

The official report Marsh filed with the FPC on August 23, 1961, apparently was considerably toned down as compared to the earlier draft. Marsh left out the flat recommendation that area-pricing be abandoned, though he continued to call attention to what he termed "serious questions as to the legality and practicality of the area-rate determination."[19] Marsh's report was used by the Commission in establishing temporary rates for the Southern Louisiana region. The Commission also determined from this report, and other evidence, that the two phase hearings which it had contemplated for Southern Louisiana

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[17]"FPC Asks Help on Gas Pricing for South Louisiana," Oil and Gas Journal, LIX, No. 27 (July 3, 1961), p. 80.

[18]"Marsh Advises FPC to Dump Area Pricing," Oil and Gas Journal, LIX, No. 33 (August 14, 1961), p. 84.

[19]"Don't Count Out Area Gas Pricing Yet," Oil and Gas Journal, LIX, No. 35 (August 28, 1961), p. 40. Citing the report to the FPC on the South Louisiana area-rate prehearing conference written by Chief Examiner Edward B. Marsh.

were impractical. It scheduled a full prehearing conference on all aspects of the rate situation in that area for November 28, 1961.[20]

The Permian Basin area-price hearings proper were initiated while the Southern Louisiana prehearing conference was coming to a close. The FPC set up the Permian Basin hearings in an order of August 2, 1961. This order established a schedule for the presentation of data to the proceedings, and in an appendix provided a questionnaire to be completed by the larger (over two billion cubic feet sales per year) producers. A shortened form was to be issued for small producers. The FPC noted that two questions seemed to raise the most interest during the prehearing conference, namely whether the cost data provided would be representative of the firms in the area and whether the individual firm data would be available to the public and to other parties. The Commission ruled that individual company evidence would be made available only to the Commission and to the FPC Staff, and that the Staff would compile it for presentation as a composite in the hearings. Once again the Commission ruled against cost-of-service showings by individual companies seeking to justify rates above those established in area hearings. It deferred final action until the regulatory decision was made, but left little doubt that such showings would be denied. The presiding examiner was given authority to take advantage of the results of the prehearing conferences to minimize the number of questions at issue. He was also authorized to expedite the hearings in any way which would not jeopardize their fairness to all parties.[21]

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[20] Area Rate Proceeding, Docket No. AR61-2; Aladdin Exploration Company, Inc.; Docket No. CI61-1564; Amerada Petroleum Corporation, Docket No. RI60-18. Order Upon Presiding Examiner's Report Prescribing Procedure and Denying Motion, 26 F. P. C. 723, 724-725 (1961).

[21] Area Rate Proceeding, Docket No. AR61-1; Claude E. Aikman, Docket No. G-18466; North Central Oil Corporation (Operator), Docket No. CI60-435. Order Requiring that Certain Data Be Filed, Directing that Said Data Be Placed in Proper Form and Presented in Evidence, Setting Date of Hearing, Prescribing Procedures for Said Hearing and Ruling on Motion and Appeal, 26 F. P. C. 247 (1961).

The hearings on the area rates for the Permian Basin began in Washington on October 3, 1961, with Samuel Wenner as hearing examiner. The Permian Basin hearings continued with first the producers and then the consumer interests presenting their viewpoints on the general economic issues involved.[22] Cross examination was allowed each party. The FPC Staff presented its conclusions in November, 1962, more than a year after the beginning of the presentation of the evidence.[23]

The Permian Basin hearing had not arrived at the decision stage by the end of 1962. After the decision is rendered by the Examiner the matter will come before the Commission itself. Undoubtedly, whatever the Commission decides, the Permian Basin area rate determination will be carried to the courts for final resolution. The close of 1962 thus found the area-price method uncertain both as to its legality and as to procedure. In the face of this uncertainty this study turns to the major categories of issues that remain to be resolved in arriving at an acceptable solution to independent producer gas regulation by the federal government.

Issues in Area-Price Formation

The issues in determining area-prices can be placed in three categories: 1) establishing the price differentials between areas and 2) establishing the area boundaries, discussed together, and 3) a problem of a different order, setting the absolute level of natural gas prices in the field. In the discussion that follows the alternative principles or criteria are described and a few comments made about each. Administrative and legal problems and difficulties are ignored for the most part at this level of the discussion. The purpose of this chapter is to determine the limits of the area-price approach within which the public policy decisions must fall, not to recommend a precise mode of

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[22] "Permian Hearing Told: Gas producers must have incentive," Oil and Gas Journal, LIX, No. 42 (October 16, 1961), p. 62.

[23] "Permian price approach irks producers," Oil and Gas Journal, LX, No. 48 (November 26, 1962), p. 52.

regulation or to predict the outcome of the FPC decision process. One operational element cannot be ignored, however, and that is the matter of adjustment of the quantities supplied and demanded under the basic area-price chosen to fulfill the policy goals. This question has been avoided in the formal FPC statements initiating area-price regulation, just as it has typically been ignored in discussions of public-utility type regulation. Because of the importance of the problem on both practical and theoretical grounds, however, some economic implications of administrative alternatives to bring amounts supplied and demanded into equality are considered.

Determination of Area-Price Differentials and Area Boundaries

The rationale for pricing on an area basis is that the gas industry as a whole is too diverse for one price to be appropriate, but that regions or areas are sufficiently homogeneous for successful regulation. This finding sets up two conflicting tensions: if diversity is a justification for different treatment of different areas, then all diversity justifies some differentiation; if different portions of an area are sufficiently homogeneous to justify identical treatment, then the homogeneity of the industry justifies identical treatment for all producers. Since these conditions cannot be met simultaneously, some more or less arbitrary distinction must be drawn between what does and does not constitute homogeneity of such scope as to allow identical treatment.

It is necessary to specify the conditions which will be considered relevant for determining both area boundaries and price differentials if the area-price method is used to regulate groups of producers. Yet, at the time of this writing, the FPC had made no final decision on what it considered to be the area criteria and there was no incontestably correct set of such criteria. The effects of different criteria diverge considerably. Three alternatives were abstracted in this study to make the regulatory choices more clear cut. These alternative approaches to area-pricing were the cost-of-production view, the value-to-consumer

doctrine, and the historical differential. Each of these is considered below.

Cost-of-production based differentials

The cost-of-production based differential is closely related to the public-utility approach. The receipts of the producer are presumed to depend upon what is expended in the effort to obtain the intended result. Therefore price is related to costs undertaken to produce gas. Before moving to a further discussion of this basis for differentials, it is important to distinguish between costs necessary to the production of gas and those which are not resource using in terms of the economy as a whole. This distinction separates out scarcity return or rent as a special category which is an expense to the producer but not to the society. A price based on cost, defined as the financial requirements for maintaining actual producers in the industry in the long run, need not include any net (rent) return to the owners of reservoir rights. Considering the interstate pipeline market specifically, the only alternative to interstate sale is the intrastate market, and in the reasonable future this alternative is simply not large enough to alter interstate sales significantly.[24] Therefore, so long as production costs, including exploration and development, are covered, the effect of gas price changes on the amount of interstate gas supplied need not be significant in the long run because there are no alternatives preferred to such interstate sales. Before that long run is settled, however, scarcity rent must be adjusted in the capital structure of the industry to the point where it does not influence decisions.[25] Because

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[24]The intrastate market developed first. Because of the absence of interstate transportation costs the rate of gas usage is high intrastate. While the amount of gas demanded intrastate would presumably rise with an increase in intrastate supply, the drop in price required to eliminate economic rent to the reservoir owner would certainly not be sufficient to increase intrastate consumption enough to significantly interfere with interstate delivery capacity. Hence the intrastate market is an alternative to any one producer but not to the industry as a whole. Estimates of the absolute magnitudes involved depend on unavailable data.

[25]Institutional barriers to reduction of rent return are

scarcity rent is not an element in the long run cost of production it is ignored in the discussion which follows directly below. The adjustment of quantities supplied and demanded to price regulation is considered in the section on the base price for gas.

There are three major categories of costs to producers which are included in both the social and private cost of producing natural gas. These are exploration costs, development costs, and the costs of producing and gathering gas from established reservoirs. Exploration takes place before fields are established within a given region. In this sense, then, exploration is an industry-wide cost which cannot logically be associated with a given geographical region. Since there is no assurance that discoveries are to be made in any one region (for there may be no natural gas there to be discovered) arbitrarily granting differentials between regions on the basis of exploration costs would not be logical. Moreover, arbitrary differentials for exploration costs would distort economic activity between regions and would only coincidentally lead to a desirable allocation of exploration activity. The cost-of-production method of determining area differentials and establishing area boundaries, then, would presumably ignore exploration costs. These costs would be compensated by an allowance over and above other costs of production. This allowance could be adjusted to bring forward the amount of exploration required to obtain sufficient reserves, as estimated by the regulatory agency.

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significant. Such an adjustment would be made only slowly with the transitional burden of reduced price falling most heavily on the producers who would be temporarily immobile. A shift toward cash royalty bonuses and cash purchases of reservoir rights would provide more flexibility.

The rent received by the owner of the right to exploit the natural gas reservoir is at present divided into two categories. The first is the customary one-eighth royalty. This return is not subject to adjustment downward in the present tradition-bound leasing negotiations. Differential rent is paid through cash leasing bonuses and additional participation in production known familiarly in the industry as "over-ride." The basic royalty, being nonmarginal, could be reduced or eliminated by regulation without disturbing the resource rationing function of differential rent.

Cost of development

The costs of development of given quantities of natural gas reserves depend on three factors. The costs associated with the differences between these factors would give rise to a portion of the price differential based on cost-of-production. The depth of the wells drilled, the deliverability of each well, and the number of wells per given quantity of reserves were the cost factors selected for treatment in this study. The depth of the wells depends, obviously, on how far below the surface of the earth the gas lies. The deeper the well, the higher the costs of drilling, both in total and in average cost per foot drilled. The depth of the reservoir depends on the field characteristics, and since these are geological variables they are independent of and only coincidentally consistent with political or geographical boundaries.[26] A given geographical area of significant size would include reservoirs of vastly different depths, while wells and fields of the same depth are scattered throughout the nation. While the average depth of fields within a political subdivision may be either higher or lower than the average depth in another subdivision, that average says nothing about the individual fields within those regions which combine to establish that average. This fact is especially obvious when multi-strata reservoirs are discovered under one surface.

What is true of well depth is also true of the other reservoir characteristics which affect well deliverability. Such matters as permeability of the producing structure and bottom hold pressure vary from field to field on geological, not geographical grounds. The number of wells for each quantity of reserves is partially a function of state regulation of production to protect correlative rights and to conserve the physical gas. As such, state regulation, in so far as it was consistent within political or administrative boundaries, would promote

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[26]It is important not to lose sight of the further fact that considerable difference between wells exists even within a common reservoir. The amount of producing strata, the position with reference to the trap, and the permeability of the producing horizon can all affect the costs of producing a given quantity of gas from different wells penetrating the same horizon.

similarity between contiguous reservoirs. Some regulation agencies, and among them those in the two largest producing states, Texas and Louisiana, determine spacing for wells, however, on the basis of depth and expense of production. In so far as this policy is followed, spacing would be tied to depth which is tied to geological factors rather than to political or administrative areas.

Costs of production and gathering

The third cost of making gas available for interstate transmission is associated with the production and gathering process. These costs per unit of gas, holding other factors constant, would be inversely correlated with the volume of gas per well, the density of wells, and the gas pressure and other delivery conditions in the field. The greater the production from a well, the greater the amount of gas for the basically fixed amount of well upkeep expense. Similarly, the more concentrated the production owned by one set of interests the shorter the gathering facilities essential to prepare it for input into the interstate pipelines. Likewise, the greater the gas pressure in the well the smaller the amount of supplementary compression required to achieve pipeline pressures. One further matter which indirectly affects production and gathering costs is whether the gas is associated with liquids as casinghead gas. Casinghead gas sources produce intermittently and in smaller quantities, typically, than gas wells. For these reasons, casinghead gas has a higher cost of production and handling than gas well gas. Any impurities in gas would also present extra costs to the producer.

The costs of production and gathering of gas are primarily associated with the reservoir characteristics from which the gas is produced, as can be seen from the items mentioned above. Just as in the costs of development, these production and gathering costs depend for the most part on geology rather than geography. Therefore, neither political subdivisions nor other sizeable surface areas would likely group together reservoirs homogeneous with respect to the factors which determine the cost of production and gathering of gas.

Conclusions on area-price based on costs-of-production

The cost-of-production criteria for differentiation between areas require that cost homogeneity exist within areas and diversity between them. Because of their nature, exploration costs were eliminated from consideration in this regard. The other significant production costs were found to depend primarily on reservoir characteristics which, while perhaps not distributed randomly with reference to geography, are not distributed consistently with surface boundaries either. Hence if an area is to contain no greater diversity within it than there is between it and any contiguous area, as one possible measure of homogeneity, the number of reservoirs or sub-reservoirs within an area will likely be few.[27] More explicitly, geographically defined area designation and price differentials based on costs-of-production would likely require so many administrative areas as to sacrifice the administrative and economic values of the area method, or else would involve averages that covered up far more diversity than they expressed. In the latter case, area-pricing would give windfall gains to low cost fields within an area, while causing abandonment of high cost fields which would be produced if located in areas with which they had more in common.

Once appropriate area boundaries were established, the determination of rate differentials based on the cost of production would pose no significant conceptual problem. The establishment of areas, however, cannot be accomplished without sacrifice of either equity or administrative ease. One possible method of promoting more equity at a minimum sacrifice of ease would be to utilize predetermined factors to compensate for certain conditions such as reservoir depth. This direction is not explored further, however, because it reopens the objection which was a

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[27]The required degree of homogeneity within and heterogeneity without an area of course determines the possible size of areas and the number of areas required. The desire for few areas for administrative purpose conflicts with the large number of areas required for equity among producers and consumers. No resolution of this conflict is possible; compromise is necessary.

strong motive for the area-price method in the first place. This was that a multiprice system for the identical commodity, natural gas, under identical conditions, led to a misallocation of resources. Another type of area differential, that based on value rather than on cost, takes up this very issue.

Value-to-consumer based differentials

The second possible determinant of area boundaries and area differentials would be the value-to-consumer. Using this criterion the gas price for a given production area would depend upon the cost of making gas from that area available to consumers at the point of consumption. There are three major elements which determine the value to the consumer of a given unit of natural gas at the consuming end of production and gathering operations. The first of these is its location with respect to the consumer; the second is the nature of the processing required; and the last is the delivery conditions over time.

Elements influencing value-to-consumer

The ultimate consumer must pay for the service of transporting natural gas from the point it enters the transmission line until it reaches the burner tip. The length of the journey is the major factor in establishing the cost of this transportation. Therefore the value of a unit of gas is inversely related to distance from the ultimate consumer by a factor determined by unit-distance transportation costs. Gas transmission facilities are also fixed in space and therefore cannot be moved in search of new reserves. A new deposit of natural gas near an existing pipeline which has excess throughput capacity would be worth more to the ultimate consumer than would that same field the same distance from the consumer but isolated from an existing transportation route. Therefore, the value of reserves depends somewhat on the historical accident of pipeline location. Finally, the economics of pipeline transportation are such that the larger the throughput desired the cheaper the unit costs of transportation, within very large limits. Therefore the value of a reserve is higher per unit if there

is a high deliverability in the immediate vicinity or where the pipeline can be routed in such a way as to achieve such a throughput.

The less processing required of gas the higher its value to the ultimate consumer because the less expense is left after the gas begins its journey at the conclusion of gathering. So long as "pipeline quality" gas is considered specifically, there is not much difference involved in processing charges. Pipeline quality gas presumes a minimum standard of purity and also a given pressure at the end of the gathering lines. Inferior reservoir gas is either raised to standard by the producer or gatherer or it is transferred to the pipelines at a price differential sufficient to cover the cost of raising it to that standard. In either case, the gas would be valued consistently with other gas used by the ultimate consumer. For this reason, it would be more satisfactory to consider processing differentials as part of the producing and gathering cost of gas than as influences on the value of a particular reservoir to the consumer.

The final element determining value to the ultimate consumer is tied in with costs of making the gas available over the long run. The greater the deliverability of gas over time, the lower the unit amortization charge for necessary transportation facilities. Therefore the consumer would value a large and long lived reserve dedicated for life higher than a reserve having opposite characteristics.

Area boundaries and price differentials:
value-to-consumer factors

The factor of geographical location which influences the value of gas to the consumer depends on the relationship between the location of the consumer and his pipeline input terminal and the location of the particular natural gas deposit. Consequently, the value to be ascribed to the gas depends on the consuming region to which it is dedicated. The region to which it is dedicated in the case of previously developed and connected reservoirs is already determined and therefore the historical accidents of past development would determine the relative value to particular consuming regions of given gas supplies. The value of

these gas supplies can be presumed to reflect the economic and technical conditions of the planning period but not of any later time.

With reference to undedicated reserves, their value to a particular consuming region can be ascertained with some degree of accuracy on the grounds of such determinable characteristics as distance and available transportation. This does not in any way similarly establish a value to the abstraction called the gas consuming public of the United States, however. Gas consumers as a whole are found throughout the United States, and for each sub-group of the gas consuming public, location will dictate a different value for any given undedicated gas reserve.[28] Therefore, while conceptually location is one of the determinants of the value of a given gas reservoir to consumers, practically, unambiguous estimation of that value breaks down because of the two-dimensional character of the relationships between gas supply and gas consumption areas.

Geographical location factors are singularly adapted to the area approach to regulation. The consideration which influences the valuation of the gas, location, is also the matter which distinguishes an area from other areas and from the surrounding territory. Therefore while disagreement could exist as to the size of an area, and while a greater homogeneity could be established by making areas smaller rather than larger, by its nature area regulation is suitable for dealing with locational differentials.

While the drawing of area boundaries is adapted to the locational element of the value-to-consumer rationale for area regulation, the determination of area differentials without specifying the consumer to which the gas is to flow is not. With respect to a given production area each group of consumers is likely to be a different distance away and to have a different set of alternative supply regions. The differential which would express the appropriate values for two reserves would differ for different consumers in different locations unless there was a coincidental relationship between the consumers and the producing

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[28] In the absence, always, of compensating differences in location.

regions. Therefore, no consistent valuation of location can be made without considering the consumers who are to receive the gas. An area-price established on grounds of value-to-consumer would differ for different consumers and therefore could not be determined unambiguously.

The geographical distribution of the major gas reserves moving interstate makes a modification of this approach possible with a limited sacrifice of clarity and equity. The Southwestern gas supply region is made up of five bordering states in the south-central portion of the nation. The major gas regions within these states are arranged in a roughly symmetrical, fan-shaped pattern with the South Texas deposits forming the handle of the fan. Ignoring markets within the region, consuming areas are basically located "outward" from all producing portions of the region. Value for each reservoir could therefore be determined in comparison with other reservoirs which lay on the same line from the base of the producing region to the consuming district in the same sector of the extended "fan." This geographic arrangement of the industry makes it possible to assign producing areas to consuming districts on a nonarbitrary basis for purposes of calculating reasonable locational differentials. No large interstate markets are located between production regions to complicate the valuation. The proper locational differential for value-to-consumer area-price would thus be such as to offset the transportation cost between any given producing area and the outermost production in the ray of the "fan" leading to the consuming district served. With this modification, the area-price system based on locational advantage to consumers can operate with only minor violations of equity in interregional gas sales. For the markets within the region, and for producing areas outside it, the appropriate differential is indeterminate. Therefore, large changes in the industry, such as gas discoveries outside the region or cross-regional transportation caused by an imbalance between amount demanded and amount supplied in one ray of the consuming--producing arc, would create value-to-consumer inconsistencies if differentials were based on location.

The nature of the processing required to bring gas to pipeline standards is, as mentioned before, a responsibility of the producers either directly or through appropriate price differentials. These differentials can be considered as an influence on the value of gas to the consumer, if convenient, and can be averaged easily on an area basis.

Area differentials due to value-to-consumer differences in delivery conditions over time are difficult to assess. Individual reservoirs, as noted in the section on costs of production, vary on such matters as deliverability and size. The differences between gas fields are not necessarily distributed consistently in terms of surface boundaries. Area boundaries, however drawn, would not necessarily encompass fields with similar conditions unless the areas were limited by geological data as well. The geological nature of developed reserves, since they are bounded by no tendency to avoid discrete jumps, make the determination of boundaries a compromise between the desire for homogeneity within the areas and the requirement for areas of sufficient scope to yield administrative gains. Once area boundaries were established, there would be little difficulty in determining compensatory differentials for delivery conditions over time so long as average results were taken as a proper representation of the diversity which existed within the area. Neither processing expense nor delivery conditions, however, are well suited for any type of area-based regulation, including that based on value-to-consumers.

Historical price differentials

Different gas supply areas sometimes receive different prices for identical gas because of conditions, such as time of development, which surrounded the industry during the time when the price pattern was set. Under other decision conditions the relative price patterns would differ from the historical pattern. The differentials originating under prior conditions cannot be defended for preservation into the indefinite future on historical grounds alone without acceptance of the resulting costs of resource misallocation and loss of equity.

The relationship between the variable factors under present conditions, of course, might argue for maintenance of historic differentials. For example, if the existing transportation facilities connect consuming and producing regions which would not be connected if the decision were to be made under present conditions, but if by ignoring sunk cost gas can be supplied more cheaply through those facilities than it could be supplied through new facilities, the differential would rest on sound economic grounds. From this example it can be seen that maintenance of historical differentials in the value of gas between different supply areas on the grounds that those differentials are historical makes no economic sense. But the optimum distribution of gas reserves among consumers may well result in maintenance of some historic differentials for economic reasons.

Determination of the Basic Area-Price for Gas

The gas price to which differentials are to be applied on an area basis must be determined whatever the accepted rationale for those differentials. The base price chosen influences both the policy and the administrative portions of regulation. This price affects the distribution of income between the producers and the consumers with each unit of gas produced or consumed. Moreover, the price of gas, abstracting from area differentials, is part of the resource allocating matrix. In addition to being one of the variables determining the consumption level for gas and competing fuels the price of gas is also one of the factors responsible for establishing price and output levels in the factor and final product markets. Rates of development and depletion of natural gas reserves similarly depend in part on the base price of gas.

The base price of gas which satisfies one of the three policy parameters chosen could differ from that which satisfies another. If this were the case in practice, and if base price level alone were depended upon for the substance of industry regulation, then goal conflicts would result. The evaluating agency, however, can choose a base price which is optimal as measured by joint maximizing criteria unless

lexicographic ordering is present. This choice would compromise estimates of the price for gas to fulfill each regulatory goal on a weighted basis according to the relative importance of those goals. In the absence of restricting legislation, these estimates rest solely on the judgments of the administrators as to the relative importance of alternative ends under great uncertainty. Economic analysis as such, then, can only suggest directions of effects and results, it cannot reach substantive conclusions as to an appropriate base price for gas under area-price regulation.

Application of the Basic Area-Price for Gas, Some Implications

Policy implications of substantive choices in regulation are considered further in a later section of this chapter. Before continuing to a policy evaluation of the area-price method, however, a digression to consider administrative implementation of area-price regulation is required for reasons of clarity. As noted above, formal discussions of gas regulation have tended to avoid the quantitative adjustment implications of regulation in the emphasis on alteration of income distribution. There are several possible reasonable interpretations of this administrative neglect. These include a short run view of the industry, which reflects high inelasticity of demand and supply; a presumption that regulation, reducing price, would bring the industry toward equilibrium by eliminating excess capacity and expanding the use of gas; and the popular conception that gas supply, if not demand, is not related to price because of the accidental or by-product nature of reservoir discovery. The high proportion of fixed factors in the industry has lent credence to analysis based on a short run view of the industry which takes the industry structure as given. Moreover, the earlier pattern of industry development was one of both excess capacity and all but accidental reservoir discovery in that the costs of discovery were not correlated with recent high returns. Hence considerable scarcity and opportunity rent has characterized the industry. When the institutionally established minimum rental relationship is added to these

factors, the practice of ignoring the requirements for adjusting quantities supplied and demanded under regulation becomes more understandable.

The presence of the above elements in the industry, however, has frequently led to a failure to consider the existence of extensive and intensive marginal production. The effect of an administered price in the gas industry, whether socially or privately established, in the long run rests both on income distribution and on the level of output and consumption. The effect on the first of these is implicit in the aims of regulation, but the effect of the second can conflict with the orderly operation of the regulated industry. The discussion below isolates the effect of regulation on the amounts supplied and demanded.

Basic area-price and the amounts of gas supplied and demanded

The base price selected under area-price regulation determines the amounts of gas supplied and demanded in the industry, if the influence of income redistribution is ignored.[29] The possible contrast between the area-price set by administrative action and the equilibrium price formed in a hypothetical perfectly functioning market is illustrated in Figure 5 below. Given the supply and demand functions shown

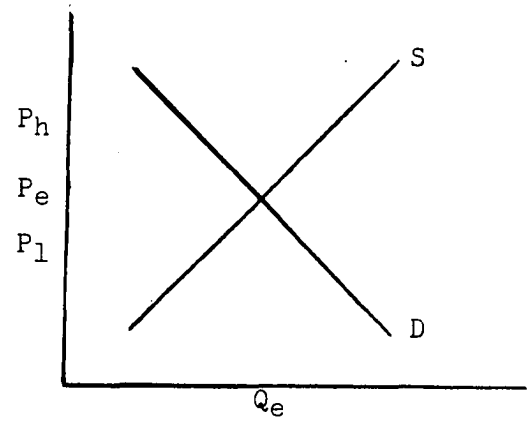

Figure 5. Area-price and quantities of gas supplied and demanded.

[29]It is assumed that interarea differentials are applied and have created a single market by establishing essentially homogeneous production and consumption sectors.

by the solid lines S and D, at price P_e, quantity Q_e is both demanded and supplied. If price P_h were designated the basic area-price, the quantity of gas producers wished to sell would exceed the quantity consumers wished to purchase. Opposite results would follow from sub-equilibrium price P_l.

Quantities supplied and demanded could be brought into balance at nonequilibrium prices, whether higher or lower, only through administrative or other action bringing shifts in either the effective supply or demand functions. Because of the similarity and essential simplicity of the relationships, for space reasons only one type of adjustment is considered in the discussion which follows. The reduction of amount demanded was selected as the example to be used in this explanation because it coincides with goal parameters which are widely held at present.[30] Three general methods of restricting demand were selected to illustrate the adjustment alternatives available. These methods are treated separately in the discussion which follows, but they are not mutually exclusive and could be used together to form a multilevel attack on imbalance between desired gas output and consumption. Because of the lack of public discussion of administrative aspects of this issue, more detail is presented than the actual importance of the matter to the main current of this study would justify.

Direct end-use control

Direct control and specific restriction of the consumption of natural gas by uses is closely related to some elements of previously accepted public policy. End-use control can be based either on blanket prohibitions of certain types of use or on specific cases; each method has been used by the FPC and other agencies in the past. A well defined

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[30]Reduction in amount demanded is consistent with the proximate goal of lower use rates for gas which in turn depends on further value factors. A lower use rate could be instituted through alteration of the supply function as well. The choice of operating on the demand side was made in this discussion because of the similarity between this action and the more common proposals usually discussed under the heading of direct end-use control.

use restriction policy has not been developed, however, by the FPC. Whatever the method used, restriction of the possible uses for natural gas would act to reduce the demand for natural gas in the field. It would serve to ration the available gas among the potential consumers where regulation reduced the amount of gas supplied below the amount demanded. The total effect of end-use control would depend on the type of uses restricted and on whether the restriction were limited either geographically or to interstate sales. Since the rationale for end-use control is to increase the total economic contribution of the reserves over their lifetimes, it is likely that the restriction would fall most heavily on the so-called inferior uses of gas. To the extent that this policy was successfully pursued, the restriction on demand would serve to make the lower part of the demand curve inelastic. A schematic representation of the application of this policy is demonstrated in Figure 6, where the conditions in Figure 5 are joined by demand curve

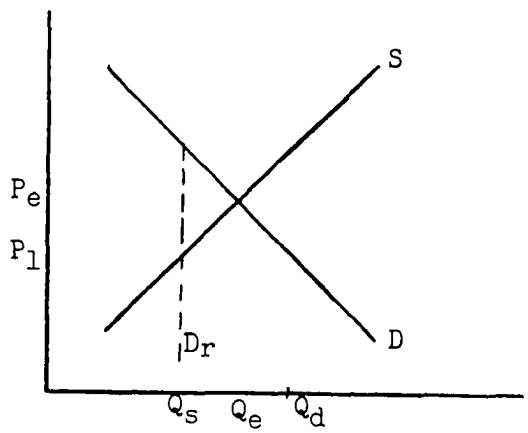

Figure 6. Area-price, direct end-use control, and quantities of gas supplied and demanded.

D_r (dashed line) showing the demand for gas after the institution of end-use controls. Area-price P_1 is now established as the equilibrium price with an output level of Q_s because of the administrative actions of the regulatory agency in shifting the gas demand function.

Private, non-price gas rationing

The second possible way to bring amounts of natural gas supplied into equality with amounts demanded is to rely on unofficial, non-price, market rationing. Even if no regulatory action is taken the gas available will flow to some consumers and others will be left without gas--the gas will be allocated in some manner. A black market might, of course, create rough price rationing through the back door which would be consistent with market oriented welfare maximization. Otherwise decisions might rest on such economically, though perhaps not socially, irrelevant factors as historical accident or timing. In a private industry, however, random allocation is inherently unstable and some economic priority system based on unregulated, non-price compensation would likely develop. A portion of the quantitative imbalance between amount supplied and amount demanded would likely disappear because of contractual obligations and the fixed nature of much gas investment. If gas is not available, potential consumers do not long remain in the consumption market but instead shift to other energy sources and make long term capital investments and commitments consistent with the shifts. The gap between the amounts of gas demanded and supplied at a subequilibrium area-price might be closed, then, in a combination of three ways in the absence of formal rationing. These factors are illustrated in Figure 7. The

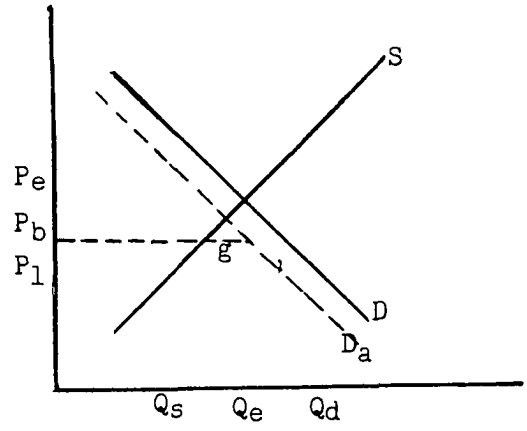

Figure 7. Area-price, private, non-price gas rationing, and quantities of gas supplied and demanded.

reduction in demand for gas caused by the irreversible (in the short run) shift of consumers to alternate energy sources is depicted by demand curve D_a which illustrates that both high value and lower value potential users of natural gas leave the market. The increase in the established area-price P_1 through black market and non-price compensation of producers is shown by price P_b. The quantities supplied and demanded at price P_b are still not in equilibrium, however, and therefore gap "g" exists to be bridged by various noneconomic allocative factors. The reduction of high value uses of gas because of shifts out of the industry and the existence of gap "g" indicate that private, non-price, gas rationing among consumers does not lead to efficient utilization of the gas produced.

Market adjustment through commodity taxation

A third method of restricting consumption of natural gas to the quantity that would be produced at the desirable area-price would be through a unit tax on consumption. Used in conjunction with a fixed area-price, such a tax would reduce the consumption of gas without affecting the quantity of gas supplied or the amount of income received by the producers as set by the chosen basic area-price. The reduction in consumption due to the tax wedge would depend on the elasticity of the demand for gas and the amount of the tax. In Figure 8 below the

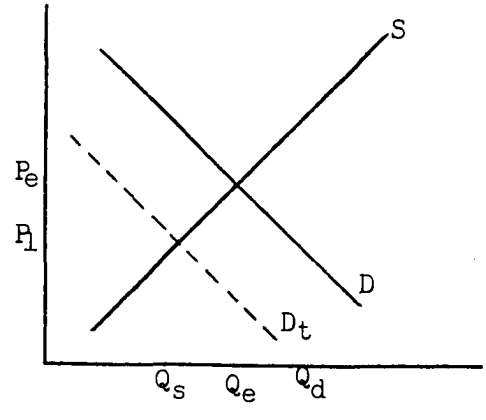

Figure 8. Area-price, unit consumption tax, and quantities of gas supplied and demanded.

total market demand for gas is shown by D. The imposition of a unit tax equal to the vertical distance between D and D_t reduces the demand for gas impinging at the field level to D_t. At the established area-price P_1 the quantities supplied and demanded are equal. Because the tax restricts consumption according to choice of consumers given the market conditions with tax, the tendency over the long run would be to allocate gas only to the highest value uses. Rigidities and technical considerations would, of course, prevent full realization of this tendency.

The market for gas is both differentiated and separable, and different portions of it exhibit different elasticities of demand. This fact complicates the administration of a unit tax as a consumption reducing mechanism. Consider the case where there are two distinct gas markets, X and Y, with X having the more elastic demand. Figure 9 demonstrates this market situation, using the same market supply and demand

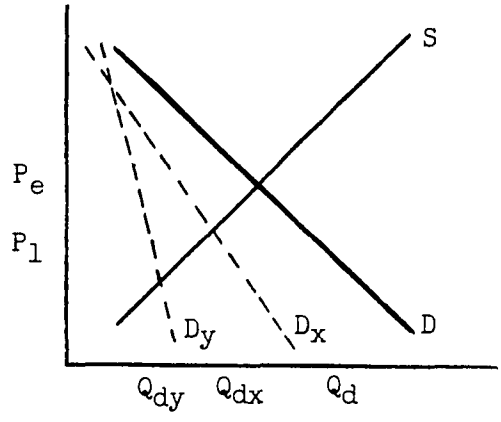

Figure 9. Area-price and quantities of gas supplied and demanded in distinct gas markets.

data found in Figure 5. A uniform unit tax placed on all consumers would reduce consumption in both market X and in market Y, but because of the greater elasticity of demand in X the drop would be greater proportionately there. If the area-price were enforced as a price rather than merely as a ceiling, so that all tax would be completely shifted

forward to the consumers remaining in the market, the conditions depicted in Figure 10 would result. The quantity of gas consumed in each market is represented by the intersection of the price line and the individual demand curves.

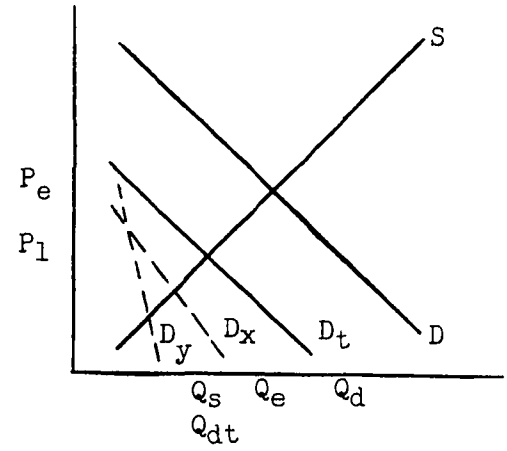

Figure 10. Area-price with unit consumption tax and quantities of gas supplied and demanded in distinct gas markets.

Policy implications of methods to alter gas consumption

Direct end-use control by administrative action requires the agency to immerse itself in the details of the gas consuming industries to arrive at decisions which will fulfill the applicable public policy goals. This task would be formidable, and even with the best of administration the complexities of applying necessarily crude criteria to actual situations would lead to confusion, controversy, and failure to make maximizing decisions. Direct end-use control would, however, allow the agency more precision in restricting consumption than would any other method. Moreover, it would permit recognition of special social costs and social benefits of gas usage and thereby potentially might increase social welfare in the present as well as over time as compared with market or other gas rationing. Similarly, direct controls could operate more rapidly and more surely than forms of control relying on voluntary adjustment over time. The FPC has used end-use criteria in

granting certificates of convenience and necessity in the past. A discretionary authority to be exerted in clear cases of conflict between social and private interest would, for these reasons, likely have a place in consumption restriction whether primary reliance were placed on this method or not.

Private, non-price rationing of gas among consumers desiring to purchase more gas at the area-price than the amount forthcoming from suppliers would tend to result in a gas allocation which would have no necessary economic rationale. The excess demand continuously hanging over the market would not be an incentive to production or marketing efficiency, and would tend as well to reward illegal or uneconomic behavior. The absence of formal action to restrict supply would, however, give a greater appearance of laissez faire. If the disadvantages of market imbalance were not obvious, a laissez faire allocation policy would likely lead to less public concern than would direct government direction of consumption.

The restriction of consumption through the use of a commodity unit tax wedge would fulfill the subsidiary goals of consumption efficiency through use of private market allocation. Allocation of gas strictly on the basis of price would allow the market forces to restrict consumption to the highest value uses before lower value uses were served. Efficiency in consumption allocation would therefore result. Some imperfections, however, would be tied into the gas consumption pattern in the short run because of the long adjustment period in the gas industry.

The use of a unit tax to adjust consumption patterns would minimize the direct incursion of the regulatory agency into the operations of the industry. Given the chosen area-price, the agency would only have to select the tax per unit which would restrict consumption to available supply. The impersonal operation of market allocation would remove the danger of special interest rulings.

Tax restriction of consumption would shift incomes from consumers to government (and ultimately to the generality of taxpayers) by raising prices paid and reducing consumption. Insofar as the reduction in the

consumption of gas brings the gas use rate into harmony with the maximizing social use rate over time, the additional price paid by gas consumers through the unit tax would bring social cost into equality with social benefit from gas consumption. In effect, the price of gas with tax would equal the alternative cost of consuming gas in the present. Indeed, the need to restrict consumption to fulfill the public policy goals expressed through the selected area-price implies the previous existence of a subsidy to consumers based on too low an estimate of the value of future gas consumption. Hence the use of a unit tax as a means of reducing gas consumption would serve to enhance both the social equity and the economic efficiency of the allocation of gas among alternative uses. The adjustment of tax rates and area-prices over time, and shifts in geographical and other production and use patterns would complicate this method of restricting consumption. Hence plans for changes in values should be considered along with the development of administrative techniques for adjusting quantities supplied and demanded.

Conclusions on the policy and administrative role of the basic area-price

The basic area-price to which interarea differentials are applied is crucial to the area-price method. It is this price which is the determinant of intersector income distribution and of the use rate of gas. In addition, however, it is the focus of conflicts in goals. If field sales regulation alters industry conditions beyond mere elimination of market imperfections some method of balancing output and consumption is required. The discussion above, abstracting from other problems, considered methods of making one type of such an adjustment, a restriction on consumption. Other directions of adjustments, for example more rapid use of natural gas, would differ only in application. The administration of this policy does not seem to exhibit unmanageable difficulty or expense, but whether the expense is too great depends on the evaluation of advantages to be gained.

An administrative issue of some importance arises from the particular nature of the structure of present and prospective gas industry

regulation authority. The jurisdiction of the FPC is limited to certain interstate gas sales. Yet any regulation of prices and quantities can ignore the effect of nonjurisdictional sales only at the risk of great inequities and losses of effectiveness of the policy. Two types of nonjurisdictional sales are of greatest importance in this regard, direct industrial sales (not for resale) by producers, and intrastate sales. These gas submarkets taken as a whole would almost certainly exhibit higher demand elasticity than the interstate market as a whole. It is obvious, then, that restrictions on consumption which were not uniformly applied to these outlets would alter the intended effect of regulation and jeopardize its very purpose. Hence the issue of regulatory scope must be resolved before administrative application of gas regulation is possible.

The central emphasis of this study, of course, is on the evaluation of the public-utility and area-price approaches to field market regulation. The administrative issue of a means to facilitate accomplishment of an element of regulation is essentially peripheral to the major task. In the more central matter of evaluation of area-price regulation the question of output--consumption balance is ignored, except for the aspect of adjustment resulting from moving toward market equilibrium without either excess profits or consumer surplus. The difference between nonequilibrium adjustment of quantities demanded and supplied, and elimination of extra-normal gains through regulation occasionally gives rise to apparent regulatory inconsistencies. For example, it might be said that a given price change under regulation would alter the quantity supplied in one case but not in another. If the dual role (use rate determination and income redistribution) of the basic area-price is kept in mind, however, the confusion between these two aspects of regulation should be minimized for the reader.

Public Policy Evaluation of the Area-Price Method

Regulation of the field sales of natural gas by independent producers for resale in interstate commerce has been evaluated in this work in terms of the three public policy goals summarized under the headings

maximum economic welfare, appropriate income distribution, and the promotion of the national interest in the use rate of the resource. The remainder of this chapter is devoted to evaluating the area-price method in terms of whether it is suitable for fulfilling these public policy goals both separately and jointly, ignoring administrative and legal issues.

Complications in evaluation arise because the area-price method is not a formula such as the public-utility method and therefore is not set and definite in its application. The FPC has not settled on the precise way in which a permanent area-price will be established nor has it decided upon the criteria by which differentials and area boundaries are to be determined. There is no obvious or generally understood formula to be applied. For this reason analysis of the ability of the area-price method to satisfy public goals is limited to the general nature of the method and to alternatives where they may be abstracted from the range of choice available to a regulatory agency or to Congress. In line with this restriction, each of the policy goals is related first to the general nature of the area-price method and then the effect of the alternative approaches to the differentials and the area boundaries is noted.

Area-Price Regulation and Maximum Economic Welfare

Economic welfare, as it is defined in this study, depends on the efficient use of resources, as measured by the private market, neglecting the distribution of income. An evaluation of the efficiency promoted by a given method of regulation depends on its effect on three levels of operations. These are the operation of the production and gathering facilities, the making of exploration and development investment decisions, and the consumption of the natural gas produced. The area-price method can be evaluated in general in terms of the first of these levels, but different ways of establishing area boundaries and differentials influence the latter two.

Area-price regulation and production and gathering efficiency

Under area-price regulation the price for a given amount of natural gas in any one field does not depend on the costs of producing and gathering that gas. The producing and gathering firm sells the gas for the area-price and is allowed to retain all the margin between the costs of producing the natural gas and total revenue. All savings through higher efficiency, then, go to the firm and do not result in cheaper gas for consumers. Under these conditions there is every incentive for the firm to reduce costs in order to enlarge profits. Hence the area-price method of regulation enlists the profit motive on the side of greater producing and gathering efficiency.

The area-price method, as it is presumed to operate, makes no allowance for costs experienced by an individual firm even if these costs are higher than the area-price set.[31] No firm is allowed to vary price on the grounds that, at the area-price, losses occur. The producer whose costs exceed the area-price, no matter what the reason, is forced to either adjust to the price discipline or leave the industry. Conversely, some resources, including superior managerial talent, are encouraged to be more fully utilized in the industry. For these reasons there is a tendency for area-pricing to upgrade the productivity of resources engaged in production and gathering operations and therefore to fulfill the public policy goal of maximizing the efficiency with which resources are used to satisfy wants, once investment decisions have been made.

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[31]Whether this matter will conflict with the constitutional bar against confiscation is not at issue at this point. The minority in the case which gave the Supreme Court the opportunity to comment on the area-price decision held that the FPC in the use of this method was going to be squeezed between setting a price which would be confiscatory against some producers while yielding others more than a reasonable profit. Wisconsin v. Federal Power Commission, 83 S.Ct. 1266, 1284-1285.

Area-price regulation and exploration and development efficiency

Investment in the natural gas production industry, to fulfill the criterion of efficiency, would be allocated to exploration and development in the areas where the greatest value, measured in consumption, would be obtained for the smallest expenditure. Unlike production and gathering operations, investment in exploration and development requires interarea allocation. The factors which influence the area boundaries and the area differentials influence investment decisions as well, and therefore an evaluation of area pricing requires an evaluation of the alternative methods of establishing those area differentials. Since historical price differentials and area boundaries do not necessarily reflect current economic conditions, this source of differentiation is ignored in the discussion.

Cost-of-production based differentials

Price differentials based on cost-of-production of given areas, if successfully applied, would make the potential gas producer indifferent as to exploration and development activity between areas exhibiting a similar degree of certainty of obtaining a given quantity of reserves. This would be true so long as the market conditions were such that gas priced so as to cover costs would find a suitable outlet. To maximize profit the producer would, however, attempt to select the subregion, no matter what the area, which would have the lowest total cost relative to its respective area. This location only accidentally would coincide with the location where the exploration and development investment would likely bring the highest value output at the lowest expense. A price based on the cost-of-production within an area, however the boundaries were drawn and whatever the general level of gas prices, would not serve to fulfill the public policy goal of maximum efficiency in the allocation of exploration and development investment.

Value-to-consumer based differentials

The social end sought through the natural gas industry is the production of value, measured by value in use, not the production of

natural gas. Efficiency in the allocation of resources within the industry requires that the end of consumption be the benchmark against which costs are measured. To the end that welfare be maximized, investment in exploration and development of natural gas should be allocated between areas on the basis of its marginal productivity in alternative uses. To fulfill this criterion all prospective investment outlets must be exhausted in turn, descending from highest to lowest value produced for each unit of total expenditure. To accomplish this allocation through the mechanism of free factor choice an incentive is required that will direct private activity to the areas of greatest benefit to the public. Differentials between homogeneous regions based on the value of a unit of production in each region to the consumer would encourage natural gas exploration and development in a pattern reflecting the maximizing allocation of investment. Maximum welfare would require, in allocating exploration and development investment between areas, that the area differential and the criteria used in determining homogeneity be based on value-to-consumer rather than cost-of-production. In sum, the ability of the area-price method to fulfill the public policy goal of maximum efficiency in the allocation of investment depends on the choice of the value-to-consumer basis for price differentials.

Area-price regulation and the efficiency of consumption

Efficiency in the consumption of natural gas requires that gas be consumed up to the point where the value of an additional unit of gas to consumers is just equal to the value to them of other uses of the resources required to obtain the gas. Regulation altering the equilibrium price of gas in the field necessarily interferes with maximization of consumption efficiency if the full resource cost of the gas is reflected in the price. Since there is no assurance that the laissez faire operation of the industry does fulfill the maximizing conditions, no easy generalization about the effect of regulation is possible. In the absence of certainty, a first approximation of maximizing allocation would have as a goal the consumption of gas by users in descending order of net value in use of the gas. The area-price approach to

regulation can be evaluated in terms of the success with which it meets this criterion. First the effect of the method as it sets the basic price for gas and the price within an area is discussed and then the interarea implications are explored.

The basic price for gas and intra-area regulation

The basic price for gas to which area differentials are added is analogous, with regard to consumption, to the price for gas within an area. For this reason the intra-area analysis will be presumed to be expanded to the basic price as well in the following discussion.

The single ceiling price within an area allocates gas among consuming districts on the basis of economic costs and alternatives, namely, the differences in costs of transporting gas from a given area to the consuming district. All gas from within an area, then, is made available to consumers at the same price; no extraneous intra-area factors enter in. In this sense the consumers purchasing from within a given area are faced with a take it or leave it choice at a price set outside the negotiations. The consumers can then adjust their affairs to the market price in such a way as to maximize their welfare, and gas will go from the reservoir to those who are willing to purchase gas at that price to the limits of the deliverability of the reservoir, again at the given price.

While the area-price approach avoids irrelevant restrictions on consumption of natural gas, and while no direct unneutral allocation signals are given by the method (as is the case with public-utility regulation) there is no assurance that optimal allocation of the gas will take place. The welfare effects of a subequilibrium area-price for gas are indeterminate if excess quantities demanded result. Under some circumstances there is no excess amount demanded, however. Price reduction could rest on excess capacity which had developed because of monopoly restraints or contractual obligations. Similarly, return to the permanently fixed factors could be squeezed without an output response within an area to the extent that this return represented a bonus over alternatives which would not be affected by the change in

prices. A gas source which represented a discrete jump in costs (manufactured or imported gas when considering the base price, gas from other areas when considering one area) or another source of satisfying the functions of gas would be examples of this type. Finally, the unit tax on consumption could be used to reduce the amount of gas demanded. If the subequilibrium area-price were administered to avoid unsatisfied demand, no losses in consumption efficiency would be expected. On the other hand, there would be no assurance that less valuable uses of gas were not served to the exclusion of more valuable uses if the area-price were such that it did not bring forth enough gas to satisfy the amount demanded at the area-price, after removal of production restrictions. Because of the importance of the surrounding factors, and the fact that no verified generalizations can be made about them at this time, the consumption efficiency of the gas industry subject to a subequilibrium area-price cannot be expressly determined.

A price set above equilibrium would result, after long run adjustment, in a reduction of consumption that would rest on decreases in consumption in the least valuable uses. Area-price regulation would fulfill the proximate goal of supplying gas first to those uses where its net delivered value exceeded that of all uses not receiving gas. Production efficiency, which is not an issue at this point, would possibly suffer at least in the short run. The effect of the intra-area price for gas on the total amount of welfare generated by the consumption of gas depends, then, on specific conditions. If excess amount demanded resulted from regulation, then maximum satisfaction, measured by willingness to pay, would not be guaranteed for the gas consumed. A price which did not leave excess amount demanded, whatever it would do to productive efficiency or to total welfare, would satisfy the condition of efficiency in the long run in determining which consumers would obtain a given amount of gas.

Interarea regulation--the price differentials

Efficiency in the distribution of gas between production areas and consumption points requires that the marginal utility of a Mcf of

gas per unit of delivered cost of that gas be equal in all consuming regions.[32] This condition would minimize the monetary cost of a given quantity of consumption benefit from the gas delivered. The cost of gas to the consumers is the sum of field price and the cost of delivery to the distribution mains, in the absence of monopoly or other exactions.

Under regulation on the area-price basis the field price of gas is established by administrative decree with private interests adjusting their activities to maximize their wellbeing given the established price. The variable costs of production are covered at the margin of production. The difference between total revenue at the area-price and these costs will be taken up by the fixed factors in the long run. Consumption efficiency, as a regulatory goal, requires interarea differentials which fulfill the condition necessary for delivering a particular quantity of gas yielding the maximum amount of benefit in consumption at a minimum resource cost. To fulfill this condition it is only necessary that the field price for each area reflect fully the relative value to consumers of the gas produced from that area. The locational factor is used as the example in the analytical model. The value-to-consumer method of determining area differentials is discussed first, below, with the cost-of-production criterion left to a later point.

Under value oriented regulation the allocation of gas from areas to consumers is based on total gas costs. These costs for a given volume of gas are lower for consumers near the gas producing region and higher for those at a greater distance, but do not vary because of the location of the particular producing reservoir within the producing region. In the absence of imperfections in the consuming markets, then, all consuming regions in the long run face the same benefit cost ratios at the margin, measuring benefit in opportunity cost terms. The

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[32]The further requirement that consumers equate the marginal utility from the last unit of expenditure for gas to the benefit from other purchases is precluded by any regulation which does not instate the results of the competitive equilibrium in the economy. The goal instituted here is limited to preventing uneconomic allocation between consuming districts.

appropriate interarea differentials are those which make up the cost of transportation differences between areas on the basis of value to the consumer defined in terms of minimum delivery costs.[33]

Going back to the "fan" model of the producing and consuming regions of the United States, a consumer is indifferent whether he receives gas from the base or the fringe of the ray of the "fan" located to serve his region because the area-price differentials balance the transportation costs under value-to-consumer determinations. Gas from any other ray of the producing region, however, is more expensive to deliver when field price is included and therefore is not an economical source. The consumer has an incentive, then, to purchase from the reservoir closer to him compared to the distance from any other gas source to the consumers closer to it. Area differentials based on value-to-consumer, considering only location, therefore minimize the social cost of delivering gas. Factors other than location affecting the value of gas can be placed in the same mold. The functions describing these other factors are additive, being reducible to monetary costs, and therefore produce no theoretical problems in joint satisfaction.

Actual determination of area-price differentials through the value-to-consumer criterion is not the simple matter described in the model above. The areas are not as homogeneous as is assumed, traditional purchasing patterns are set because of fixed transportation facilities, the producing--consuming regions are not so located as to fulfill the "fan" analogy perfectly, and the possibilities of adjustment are limited because of overlapping decision times. Nevertheless the discussion does point out, using transportation distance as an example which could have been repeated for the other variables, that value-to-consumer differentials relate production and consumption in a way which contributes to welfare maximization because it leads to efficiency in interregional gas allocation. Differentials based on cost-of-production, to which we now turn, have no such promise.

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[33]Considering here, as in the rest of this example, only the location element of the value of a reservoir to consumers.

An alternative method of establishing differentials between areas is on the basis of cost-of-production within those areas. Consumers would have an incentive to obtain gas from the area where the sum of costs of production and costs of bringing the gathered gas to the burner tip were lowest. The price of gas in the field would be set by administrative decree under area-pricing. Under these circumstances the consuming region which would get the cheapest gas would be determined by noneconomic factors such as development timing and accident. There would be no economic pressure exerted to change the distribution of gas once it was established because price differentials would not shift in response to economic changes in the consuming sector. Therefore whatever consumer pattern existed at the initiation of regulation would likely be maintained.

The area source of gas which would minimize delivered gas cost to one of the consuming regions would not necessarily be consistent with the source--use pattern which would minimize the costs for all consuming regions taken together. Take the following synthetic case as an example. Consuming region A is nearer high-cost producing area Z than to low-cost area X, while consuming region B is nearer low-cost X than high-cost Z. The success of A in obtaining a lower delivered gas cost (sum of field price and transportation cost) through purchasing from X rather than Z is at the expense of B. As a result of A taking gas from X, perhaps because of earlier development, B has to look to Z which is more distant and has a higher field price than X. While under free price conditions B would be able to bid X away from A, it could not if price were not allowed to serve as a rationing device, as it would not be under cost-of-production regulation.

The total resource cost of a given quantity of gas consumed in both A and B in the example above would be higher by the amount of cross hauling if the two potential consuming areas did not use the gas supply closest to them. The reduction in delivered cost of gas to A is less than the increase in cost to B because of the costs of cross hauling. End uses which are not otherwise economic are feasible if A uses gas from low-cost X. At the same time, B, relying on Z rather than X as its

gas source, is unable to satisfy uses for gas which it would be able to satisfy if its gas source were X. A shift of gas use from A to B results in a reduction of gas used where benefit is just equal to a lower price than in region B. Similarly, an increase in gas used in B leads to benefit from consumption equal to a price higher than the marginal gas cost in region A. Therefore less valuable consumption uses of gas are substituted for more valuable consumption and total benefit from a given quantity of gas consumed rises if distribution is altered. Another way of reaching this same conclusion is by pointing out that the benefit/cost ratios considering only necessary costs (production plus lowest cost delivery to consumption point for the outermost gas in each region) differ between regions, showing suboptimal resource allocation, even if observed benefit/cost ratios are identical.

The foregoing analysis, based on one example, does not imply that all interarea differentials based on cost-of-production will necessarily result in reduced efficiency in consumption. It does imply, however, that while under perfect adjustments this misallocation would not occur under the value-to-consumer method of determining area differentials, it would occur under cost-of-production differentials unless it resulted in coincidental value-to-consumer production--consumption patterns.

The example used above was highly simplified for explanation purposes, but the effect of one region obtaining gas from outside the segment of the production area where that gas would come from under value oriented price (whether through market operations or by regulation) would be the same whether the interregional pattern was as clear cut or not. The method of establishing interarea differentials is therefore significant in maximizing the efficiency of consumption of natural gas under area-price regulation. The importance of consumption efficiency in maximizing economic welfare is difficult to estimate. No gains of great magnitude would be quickly forthcoming no matter what the type of regulation because of the resistance to change due to high fixed costs. Differentials based on value (in alternative uses) of what is removed from the ground rather than on the costs of producing it are

consistently more conducive to highest satisfactions for consumers, however, regardless of whether the industry is viewed in its exploration and development, production, or transportation and distribution phases. Use of resources to maximize welfare, ignoring the distribution of that welfare, is only one facet of public policy toward the natural gas industry. Another aspect of that interest reflects upon the distribution of that welfare between the producing and consuming segments of the industry.

Area-Price Regulation and Appropriate Income Distribution

The public policy goal of an appropriate income distribution is one of the ends sought through area-price regulation of the natural gas industry. While both consumers and producers can be made to understand the desirability of lowering the costs of making gas available to the ultimate consumer, the issue of income distribution between them is a matter of irreconcilable conflict. Appropriate income distribution rests on values which are outside scientific inquiry, and no verifiable decision can be made as to the gas rates which would guarantee such a distribution. Regulation techniques can be judged, however, on their ability to institute <u>whatever</u> distribution commends itself to the properly constituted authorities. In this section, the area-price approach is analyzed alone. The use of a unit tax on consumption to balance the desired use rate along with an area-price which would restrict rent return to the factors has already been discussed as an administrative expedient. The following discussion does not deal with this alternative, or other supplements to area-price regulation, because of the desire to focus on the area-price method at its simplest. In the discussion below consumers and producers are presumed free to react to price regulation. The nature of their reaction is predicated on maximizing behavior.

One impact of price changes in the industry is the alteration in the quantities of gas which will be supplied and demanded in the long run. Redistribution of income through nonmarginal taxes or subsidies

can take place without affecting amounts supplied and demanded, but all other shifts will disturb industry equilibrium unless administrative countervailing pressures are employed. The durable nature of consumer and producer investment delays response to area-price changes, but the process of adjustment continues until some resolution of conflicting tendencies is secured. In this portion of this study changes in the distribution of income between producing and consuming regions will be understood as changes in the distribution of income between consumers and producers active in the industry both before and after adjustments to regulation are made. The gains and losses of those entering or leaving the industry because of price changes are real, but cannot be measured or even estimated satisfactorily because of the inaccessibility of a measure of the value of alternatives foregone. The analysis which follows abstracts from the output--consumption balance question discussed above.

Gross transfers of income, neglecting benefit, depend on the elasticity of demand for gas between the area-price established and the prior price. If the demand for gas as a whole (considering all consumers whose rates are changed, and assuming that the rate changes are made so as to maximize producer income) is inelastic, an increase in price will transfer money from the consumers to the producers. If the demand for gas as a whole is elastic, an increase in price would transfer gross income from the producing to the consuming sector. The opposite holds, of course, for price decreases. This gross measure of income change is not meaningful in welfare terms because the costs of the new condition, both in consumption and in production, are ignored.

Response to area-price regulation affected by industry conditions

The response of amount supplied and amount demanded to price changes is sometimes affected by conditions which have some claim for special consideration. Among these are monopoly and monopsony, the method of determining the royalty interest, and nonmaximization at the time of regulation. The last of these elements can be explained briefly

within the general maximization framework as the result of short-run conditions (production, transportation, or distribution bottlenecks, as examples) or noneconomic factors such as regulation.

Monopoly and monopsony have been explored in several studies, the results of some of which are summarized above in Chapter V. For the most part, the writers consulted agreed that monopoly was negligible. The quasi-monopoly return to producers, which has rested on the immobility of implanted gas transportation facilities, has been somewhat counterbalanced by the long term contracts at stable prices negotiated by some gas purchasers. In the first instance, the producers have been able to obtain and maintain supra-normal return when they have controlled the only gas supplies within easy reach of pipelines. The limit to such return has depended upon the capital cost of developing another gas source, which varies, of course, in each case. The pipeline purchasers have obtained gas far below the cost of alternative supplies when long term contracts without price flexibility have held the price of gas in the field at levels representative of a different period in industry development. Regulation which would replace these nonrepresentative prices with area-prices developed on some industry-wide basis would bring about a change in the distribution of income and a change in the amount of gas demanded and supplied. Whether that change would be toward or away from the equilibrium which would have existed in the absence of imperfections in the market depends on the particular case.

Area-price regulation raises interesting questions with regard to the royalty interest in gas production, especially as regards income distribution and the amount of natural gas supplied. The royalty interest historically has not exhibited enough flexibility to assure that it covered only the cost of alternatives. The basic royalty, the one-eighth of production value payment, is a matter of tradition in the industry and is generally not considered negotiable as a minimum. Some flexibility is preserved for better-than-average production prospects by means of the leasing bonus and royalty overrides, but this is not adequate to cover the range of variation existing. For example, since the royalty is pure rent owners of drilling rights for land with

marginal possibilities theoretically should obtain only enough return to make them indifferent as to whether exploratory drilling took place. Yet the one-eighth royalty holds whatever the prospects. This share could be reduced at the margin without reducing the quantity of gas produced, transferring income to the consumers, or else more gas would be produced if this share were available to the producing interests as compensation for more risky and less profitable exploration and development. The effect of area-price regulation on the distribution of income between royalty owners and consumers, and on the amount of gas supplied, partially depends, then, on the flexibility of the minimum return to royalty holders under area regulation.

Income redistribution among those remaining in the industry

The effect of price change on the income of those who remain in the industry, both on the production and on the consumption sides, is direct and general. That is, as price increases in the field the consumers who continue to purchase the same quantity of gas will pay a greater amount than they did before the price change, ceteris paribus, and the income of the producing interests remaining in the industry will increase compared to the income under the lower prices if the same quantity of gas is sold by these producers. The area-price method is capable of great flexibility in adjusting the amount of this change by increasing or decreasing the basic area rate itself. The distribution of the changes within the sectors, however, is not uniform. This unequal impact of income shifts depends only partly on the method by which area differentials are established. The refinements necessary for adjustment to the method of determining area differentiation are noted following an examination of the general impact of area-pricing on income distribution.

Income distribution effect of price changes on consumers and producers

Residential consumers (persons purchasing fuel for own use) of natural gas provide the most straightforward case of income

redistribution due to regulation. The higher the price of gas to residential consumers, the lower the total quantity of goods and services, including gas, which they can purchase; the lower the price to them, the greater the possible purchase of gas and other commodities. The price of gas delivered to ultimate consumers thus has a direct and immediate effect on their real standard of living. It is impossible to specify the amount of impact on residential consumers associated with a change in gas field prices, however, because such a change in the field might change the delivery costs and either be offset or magnified in its eventual effect on consumers. The demand of residential consumers for natural gas is more inelastic than that of other consumers. Any price change has, it follows, a larger proportionate and volume effect on the nonresidential consumers who consume about three-quarters of the total gas consumed. The changes in total gas demanded, including both residential and nonresidential uses, due to price changes in the field would possibly affect transportation and distribution costs per unit because of the scale economies involved. Since the transportation and distribution of gas are generally regulated on a cost-of-service basis, any cost changes supposedly find their way into the delivered price of gas. Hence the residential price of gas will be influenced by these secondary cost changes as well as by the field price changes themselves. Because the magnitude of the secondary changes cannot be estimated, the extent of the effect on consumer income of a given field price change cannot be predicted without study on a case by case basis.

The nonresidential consumers would be subject to the same modifications of transportation costs due to quantity changes as would the residential consumers. Several other possible factors also could alter the effect of a change in field price on their incomes. The nonresidential consumers, having a more elastic demand for gas, are probably sheltered from an increase in the price of gas more than are residential consumers, and would probably receive a larger proportionate share of any price decreases that resulted from regulation. The share of the field price changes, and of costs of delivery per unit of gas, would be divided according to conditions in each consuming area, including the

influence of the regulatory agency. Assuming that some portion of the total net income change is not passed on to the residential consumers, that portion could either be absorbed by the transportation and distribution firms, could accrue to the nonresidential consumer, or could be shifted forward to customers of the consumer or could be shifted backward to the suppliers of other factors to the gas using firm. Because of regulation, the electric generating plants, for example, would pass most of any price change on to customers. Determination of the net distributional effect, whether by income group or class of consumer, of gas price changes in the field cannot be made, therefore, without an intensive study which would also entail considerable estimation.

Income shifts from price changes are more clear-cut on the producing level. In the long run the effect of regulation would be on the fixed factors, not on the mobile factors which are able to shift in response to best profit opportunities. In the short run the contractual residual claimants would be forced to accept most of the variation in return. These claimants are primarily the ownership interests in producing operations and those, like the royalty holders, whose incomes are tied to these operations. The length of the long run would differ according to the type of activity considered, but marginal shifts would be effective in initiating adjustment even while the mass of the industry was still geared to the previous conditions. In general, regulation would bear most heavily on the reservoir interests, including both the royalty interests and the producing owners of reservoir rights.

Income distribution effect of the method of calculating area differentials

Alteration of the method of calculating area differentials increases or decreases the quantity of income redistributed among different groups of consumers and producers. For example, if the cost-of-production method were adopted the consumers receiving their gas from low cost, high value-to-consumer areas would be benefited as contrasted with those consumers who received gas from high cost, low value-to-consumer regions. The distribution of income between classes of

consumers, such as residential and nonresidential users, might also be affected by the area differentials selected. At the production level, the cost-of-production method would aid a firm which had low costs but was in a high cost area, while the same firm would be worse off under value-to-consumer regulation if it were in a low value-to-consumer region.

Either method of calculating the area differential could result in the desired amount of redistribution because it is the base price itself which is the income shifting factor. Gross shifts between the producing and the consuming regions are not, however, the only goal in income redistribution policy. There is a general desire to shift income in such a way as to have the least possible effect on welfare maximizing production patterns. Because of the correlation between cost-of-production regulation and income between areas, the cost-of-production method could be used with more precision to limit rent return and to prevent confiscation than could the other method. Through the cost-of-production method price variation between areas could be controlled to increase the chance of keeping active the desired amount of production. At the same time, however, the cost-of-production method would not encourage efficiency in resource use nor could it be used to adjust the flow of gas to consuming areas in a manner designed to maximize consumer welfare. Neither possible way of determining area differentials is capable of the variety of adjustments theoretically possible through case by case regulation. Area regulation to alter the distribution of income also, of course, affects the rate of gas consumption.

Area-Price Regulation and the Promotion of the National Interest

The national interest in the allocation of natural gas over time to maximize social benefit from it can be fulfilled through field price regulation on an area basis. The amount of natural gas consumed and the amount of natural gas exploration and production are both influenced by the single variable of price. An increase in gas price would at the same time reduce amount demanded and increase the amount supplied. The

opposite results would follow from a reduction in the base price of gas. Area prices set by the regulatory authority therefore determine the quantity of gas which individuals and firms wish to discover, produce, and consume, and hence can dictate an allocation of gas over time. The emphasis in this section is on the limits of control over the amount of gas produced and consumed; balance between desired output and consumption, an administrative matter, is discussed elsewhere.

The area-price method of regulation by itself can restrict the use rate of gas but in the long run cannot increase it beyond the quantity associated with the competitive equilibrium in the industry. Whatever the direction of the deviation from this equilibrium, if it could be maintained by administrative action, its existence would in the long run reduce the quantity of gas utilized. As illustrated in the left graph of Figure 11, at a price above competitive equilibrium, P_a, the producers would desire to produce a greater amount of gas, Q_s,

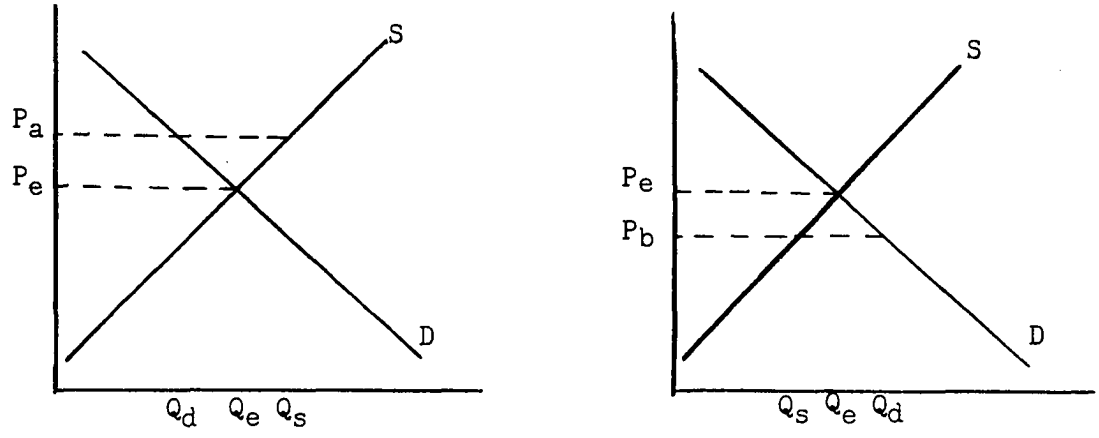

Figure 11. Non-equilibrium area-price and restriction of amount of gas produced or consumed.

than the consumers wished to purchase, Q_d, and the lack of a market for the gas would limit sales and ultimately restrict production. In the other direction, price P_b in the right graph would bring forth a greater amount demanded, Q_d, than there was gas, Q_s, to match the desired purchases. Some increase in gas use through price regulation would be

possible if pre-regulation market imperfections had previously held consumption down. The short run impact of regulation could be in any direction. Given the length of the adjustment period in the natural gas industry, and the flexibility of some of the factor returns, the region of price influence on depletion of gas would in practice be larger than would be expected from the discussion above.

The method of determining area differentials would have one major effect on the availability of natural gas over time. If the cost-of-production method of determining area differentials were used, the production from high cost areas would be increased at the expense of production from low cost regions. The cost-of-production method would therefore keep some sub-marginal (under different regulatory criteria) operations in production at the expense of rent returns in the more efficient lower cost reservoirs. The proportion of actual hydrocarbon produced relative to the quantity originally in place in the sub-marginal reservoirs would be increased. The amount of gas available over time, defined solely as the quantity remaining in the earth in economically producible form given present technology, would rise as a result. The sub-marginal reservoirs, which would not likely be re-entered after once being abandoned, would produce more gas, and the other reserves of natural gas, ceteris paribus, would remain as economically attractive as before. The social cost of this additional producible capacity would be higher costs of production and lower utilitization of the gas in the present. The effect on total social welfare over time would depend on such unknown economic factors as developments in production technology and availability of gas substitutes in the future. Value-to-consumer differentials would reflect the currently efficient allocation of resources. They would lead to earlier abandonment of marginal reserves compared to cost-of-production differentials. Thus while alternative methods of establishing differentials could be used to arrive at a given use rate of gas over time, the ultimate physical recovery and the cost of obtaining the gas would differ according to the method chosen.

Summary of the Ability of the Area-Price Method to Fulfill Specified Regulatory Goals

Evaluation of the public policy potential of the area-price method was approached above on a goal by goal basis. A summary of these results points up the exceptions to the general conclusion that the method can be used to maximize public policy goals taken separately. Two aspects of the area-price method were distinguished above, the base price or intra-area regulation, and the interarea differentials.

The single area-price within a production area establishes the necessary conditions for maximum economic welfare in production. Commodity based regulation of all similar products places cost discipline on producers and on those making exploration and development decisions within an area. No price signals leading to inefficient use of natural gas by consumers are given by area regulation itself. The area method, as analyzed, is capable of changing the distribution of income among those remaining in the industry. Administrators using the area-price method alone, however, do not have a means of reconciling the gains or losses in wellbeing to those moving into or out of the industry because of changes induced by regulation. Finally, the use rate of gas over time was found in this model to be subject to administrative control through the area-price method, but only if the desired change required a movement toward laissez faire equilibrium or toward a consumption level below that equilibrium.

Two methods of determining differentials between areas were considered in this evaluation. It was found that the value-to-consumer method fulfills the efficiency criterion while the cost-based area differential does not. At the same time, however, the cost-based area differential is capable of more precise income redistribution between the producers and the consumers because it is directly keyed to covering costs in the field and returning no more than a specified but flexible level of profit on production and gathering operations. The cost-based method is capable of eliminating the gains and losses from nonrecurring or random conditions. There would be no means of controlling these

elements under the value-to-consumer method. There is no obviously correct choice between the different income distribution effects of the alternative means of calculating area differentials. With reference to the issue of gas availability over time, the cost-based differential leads, following the discussion above, to greater production from marginal reservoirs at the expense of efficiency in the use of resources other than gas in place. Both types of differential would be consistent with allocation of gas over time toward less use in the present because the instrument for this purpose is the basic area-price. Whatever the success of the area-price method when dealing with single goal maximization, however, effective public policy demands the reconciliation of all three goals for an optimum solution to gas field price regulation.

The Area-Price Approach and Joint Satisfaction of Field Price Regulation Goals

Joint complete satisfaction of each of the three goals of regulation in the natural gas industry is required for an unreserved positive judgment on the efficacy of the area-price approach. Such a judgment could be expected only if the goals were a part of a central unifying system relating the fulfillment of all goals to one another. The three goals considered in this study, maximum private economic satisfactions indicated through consumer choice, appropriate income distribution between the gas producing and the gas consuming segments of the economy, and the proper allocation of gas over time to maximize total social welfare, do not represent such a system.

Regulation capable of compromising conflicting goals so as to arrive at an optimum for the total function is the best alternative to the perfection which is denied natural gas field price regulation. Regulation, if it is to be preferred to laissez faire, must enhance the total social welfare as defined by the prescribed evaluating agency. The evaluation and quantification of potential gains and losses has as a necessary condition regulation which makes predictable changes in the variables whose welfare results are to be optimized. Two matters are

reflected in the evaluation of a regulatory method which meets the basic test of sufficient flexibility to consider the primary public policy goals. The first is the qualitative effect of the method itself and the other is the effect of any particular values for the goals to be sought, the substance of the regulation.

Area-price regulation as a method

In the regulation of the price of natural gas in the field the area-price method, as a method, does not necessarily conflict with the selected goals of public policy except that some sacrifice of either distributional precision or production efficiency is required according to the area differential criterion chosen. The use of the value-to-consumer method of determining area differentials, while leading to an efficient allocation of resources, does not allow as much flexibility in adjusting the distribution of income as does the cost-of-production method of providing for differentials. For example, windfall profits or losses are not considered. While cost-of-production differentials make more redistribution possible with less confiscation and/or rent return, they also provide less incentive for efficiency in the allocation of resources. Since one criterion for differentials must be chosen, the sacrifice of fullest satisfaction of one of two goals is necessary if the area-price method is to be used alone. For reasons of conciseness, only one method for arriving at area differentials is used as a basis for the evaluation of the area-price method below. The value-to-consumer method was selected as the vehicle for the remaining discussion of area-pricing. The cost-of-production criterion can be substituted with some alterations in the analysis.

Ignoring this exception, the area-price method is not inconsistent with the selected public policy goals.[34] The area-price for

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[34]Always with the provision that the effect of regulation which does not merely correct market imperfections is to alter the consumption patterns of consumers so that the ideal welfare maximizing allocation of resources is not possible. This is the necessary result of regulation of whatever type which changes the quantity of gas consumed. This matter is discussed further below.

gas which would maximize welfare from one goal, taken alone, would not necessarily maximize welfare from the other two. The reconciliation of these conflicting values is required for successful regulation.

The substance of area-price regulation

The substance of area-price regulation lies in the actual prices chosen to maximize social welfare. Selection of a maximizing basic price and set of price differentials implies an ability to measure in common units the effect of each price and set of differentials on the satisfaction of each of the public policy goals. It further requires that the effects of these prices on the different goals in terms of welfare be additive rather than exclusive, which implies in turn that the decision making agency must be capable of estimating the effect on total social welfare of small changes in the relative maximization of each goal.

A small change in area-price can have three results, holding other factors constant, whether estimates of welfare changes from price changes are possible or not. These possibilities are net contributions to welfare from each of the variables, net reductions in welfare from each of the variables, or mixed gains and losses in welfare from the variables. The first two conditions are not optimal because some further change must lead to greater total welfare. The third condition, of course, might or might not be the optimum, given that decision matrix. For the third condition, if the net effect on welfare of a small change in price were other than zero, further change in the appropriate direction would lead to greater welfare. Conceptually, however, total welfare is open-ended as to influences, and therefore greater welfare might be obtained from some totally different regulatory method. Hence, in an absolute sense, the superiority of a given regulatory decision cannot be demonstrated. Within the circumscribed limits of control by area-price alone, however, the lack of net gain from any change in price establishes the optimum solution.

The area-price and maximum economic welfare

The general model described in the above paragraph can now be applied to the particular elements of area-price determinations, neglecting the interarea differentials. The goal of efficiency is neutral to quantitative changes in price under the area-price method. There are two exceptions to the neutrality of the substance of area-price regulation to the efficiency of production and consumption. The first of these exceptions is the violation of consumer sovereignty by the unneutral consumption effects of regulation. This issue has been ignored through most of this study because it is an inevitable result of any price, however determined, which is not the product of adjustment to a competitive equilibrium with all the highly abstract maximizing conditions implied by that state. Accepting these criteria, however, the nearer the area-price to the equilibrium price the greater the consumer satisfactions, given the further assumption that other segments of the economy are similarly competitive.

An excess amount of gas demanded provides the second possible exception to efficiency in allocation under area regulation. With excess amount demanded, price does not necessarily allocate gas only to those consumers who are able to outbid other potential purchasers. At the same time, of course, lower value uses are not positively promoted by this regulation. Use of the unit commodity tax or other administrative devices along with area-price regulation could resolve this difficulty. With these two limitations, then, the efficiency goal of public policy would be consistent with any prices selected for income redistribution or use rate allocation purposes.

The area-price: alteration of income distribution and use rate over time

Income redistribution and changes in the use rate of natural gas, after allowing for all adjustments to regulation, depend on the area rate established. A satisfactory regulatory method would have to enable the decision makers to attain the selected policy goals whatever the quantitative value assigned to income distribution or to use rate.

The decision maker conceptually could seek two directions of movement from laissez faire equilibrium for each of the goals. These possible four directions of movement, with their corresponding directions of rate changes, are listed in four statements below:

1. Income redistribution toward the producer--above competitive laissez faire equilibrium rates
2. Income redistribution toward the consumer--below competitive laissez faire equilibrium rates
3. Higher present use rate of gas--impossible of attainment with rate changes from competitive equilibrium rates
4. Lower present use rate of gas--either above or below competitive laissez faire equilibrium rates

Statement three describes a goal which cannot be met through area-price regulation alone. If higher present use is sought by the regulatory agency another method of regulation must be used. Any regulation depending on price changes in the long run will decrease production and consumption either by lowering the amount of gas supplied to the market or by lowering the amount consumed, as the analysis related to Figure 11 above demonstrated. Therefore, in the absence of another element to regulation such as perhaps a negative commodity unit tax, the fulfillment of statement three must be interpreted as the competitive equilibrium price, or else laissez faire. Therefore one effect of any regulation will be to reduce output and consumption in the long run. This would be interpreted as an addition to social welfare as identified by the evaluating agency if reduction were desired, or as a reduction in social welfare if it were not.

The other three statements can be positively fulfilled by regulation which shifts price away from the established equilibrium. In the natural gas industry a lower current use rate of natural gas is consistent with both an increase in rates and a decrease in rates. Therefore, reduction in use of gas is consistent with both income redistribution toward producers (statement one) and redistribution toward consumers (statement two). The maximizing price for both goals can therefore be on the same side of the laissez faire equilibrium price. No neutralizing

effect between goal maximizing rates need result from compromise of these two goals because the direction from equilibrium for both is, or can be, the same.[35]

The difference from the laissez faire equilibrium price which would fulfill the individual goals need not be the same just because the direction of the difference is the same under most circumstances. For example, with a laissez faire price of twenty cents per Mcf, the price which would best satisfy the use rate goal might be eighteen cents per Mcf while the best price from the income distribution standpoint might be fifteen cents per Mcf. The price which would be optimal would lie between the maximizing price for each, in a position dictated by the relative importance of the different goals. Given a common measure of welfare gains and losses from each goal, this optimal position would of course be at that price where no change could bring a net gain. Ignoring the efficiency criterion, then, the area-price method could be used to establish a field price for gas which would maximize welfare as defined in terms of satisfying given goals.

Area-price and total welfare maximization

The efficiency criterion must be readmitted to consider the exception to the general conclusion of area-price efficiency maximization. A price chosen for its income distribution and use rate maximization effect which was below the laissez faire equilibrium would not assure that high value uses would receive gas to the exclusion of inferior uses. The inefficient allocation of gas among consumers is only a possibility, not a necessity, but would require some consideration in arriving at an

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[35]The only exception to this statement would involve movement away from the laissez faire price but toward the long run competitive price. If this sort of movement is possible there can be an increase in consumption at the same time that there is a change in the distribution of income. Similarly, there can be changes in the distribution of income without shifts in the quantity consumed so long as the distribution shifts result in counterbalancing movements around the long run competitive equilibrium. The possibility of neutralizing changes exists, then, but is not highly important in quantitative terms.

optimal price in the sub-equilibrium range. The effect of this variable, if conditions were such that it came into play, would be to sway the Commission toward rate changes in the direction of laissez faire equilibrium because the mere possibility of inefficiency would change the maximizing estimate of the optimum area-price.

The area-price method, to summarize its positive capacity, is such that the three goals of maximum economic welfare, appropriate income distribution, and the national interest in the allocation of gas over time can be considered jointly. The optimal basic field price for natural gas on the area basis, along with the appropriate differentials between areas and the area boundaries to which those differentials are to be applied, can be determined to the extent that satisfactions from the fulfillment of each of these goals can be reduced to a common denominator and measured. Whatever the substance plugged into the general public interest framework selected for this study, the regulatory agency can reach an area-price which it can unambiguously designate as optimum.

The major limitation to area-price regulation as a means of expressing the total social interest is the inability to reflect the losses or gains sustained by consumers because of the alterations in the choice conditions between gas and other goods. Since variables outside the industry are not reflected in the decision data, the gains (losses) from additions to (reductions of) consumption of gas compared to other goods cannot be included directly. They can be implanted arbitrarily into the formula solution arising from the area-price to make it conform to the wider social interest, but only at the cost of dilution of the quantitative anchors which led to the designated field price in the first place.

The Area-Pricing Approach and the Question of: "What is Maximized?"

Throughout this portion of the discussion it has been assumed that the regulatory agency knew what ends it sought and that the only issue was a means to attain these ends. Strictly speaking this is the

only situation which is amenable to analysis. The source of the values which are to be implemented and the values themselves are beyond discussion unless the opinions and values of the present writer are interjected. Given a social welfare function, including its substance as well as its form, predictions and prescriptions of the type found in this study are possible which will enhance its fulfillment. But there is no way to demonstrate that another social welfare function would not be preferable to the first. Portions of the discussion in Chapter VI above were centered on this topic. At that place the only indication of a way out of value judgments implemented by political power was the concept of the self-validating social welfare function presented by Rothenberg. This concept might hold promise for a consensus in the regulation of the natural gas industry. The public-utility approach of cost-based regulation has, in fact, historically enjoyed a popularity of this order. It must be remembered, however, that no matter how careful the balancing of costs and benefits from regulation, the basis for decision is still in the values of the regulatory agency, and is not to be found in some scientific interpersonal measure of total social welfare.

The area-price approach to the regulation of the sales for resale in interstate commerce of the independent producer is only one method of regulation. It exists alongside the public-utility approach discussed in Chapter VII. The sole issue for public policy is not the ability or inability of a given form of regulation to allocate resources in an industry. Nor is it to arrive at an optimum solution to achieve a particular social welfare function. The basic issue is obtaining the regulatory method which not only makes possible a proximate optimum solution to given policy goals, but which also fulfills the criterion of being better than all other alternatives, if the costs of regulation are included. The study of the regulation of the natural gas industry has led us to the point where some tentative conclusions on this last and most important point are possible.

CHAPTER IX

CONCLUSIONS

The analysis of the federal regulation of the sale for resale of natural gas in interstate commerce presented above was designed to test the hypothesis that alternative methods of regulation could be evaluated on grounds of their gross consistency with certain predetermined goals in public policy. The results of this study supported the hypothesis because it was found that, conceptually, different regulation methods were able to fulfill the goals chosen with different degrees of success.

Two positive regulatory methods were selected for the examination, the public-utility method and the area-price method. These methods were chosen from among the possibilities because of their relevance to current public policy discourse. The particular goals were selected because they coincided roughly with commonly held values. The evaluation of goal fulfillment potential in absolute terms resulted in a finding that the area-price method was capable of meeting the basic criteria established by the goals selected but that the public-utility method was not. The conclusions reached in this study spanned two levels of analysis. The first was directed to an evaluation of alternative regulatory methods, the results of which have a direct and immediate practical interest. At a higher level of abstraction, some tentative conclusions were drawn as to the applicability of the analytical methods used in this study to other public policy problems.

Conclusions on Regulation of Field Sales of Natural Gas

The findings of this study in determining the most desirable method of regulating the field sales of natural gas in interstate

commerce provide some suggestions directly applicable to current public policy discussion. While the more general economic issues were considered above, the administrative implications of alternative regulation methods were reserved for discussion at this point. Another matter taken up below is the use of a unit tax on consumption in conjunction with the area-price method. It was found to offer advantages over the area-price approach used alone. The final practical conclusion on gas field price regulation within the current political structure was that the FPC, to be effective at its task, must assume responsibility for development and application of policy within the general framework of Congressional sanction.

Comparison of the Public-Utility and Area-Price Methods of Regulation on the Operational Level

The two major alternative regulation devices, the area-price approach and the public-utility approach, were outlined and analyzed above in Chapters VII and VIII. In those chapters the major emphasis was on the ability of the particular method to adjust certain factors leading to fulfillment of the goals of regulation selected. In the comments below the methods are compared in their satisfaction of administrative and procedural criteria to determine whether the conclusions drawn in the goal-satisfaction context would be voided in the application of the methods to the industry. Value-to-consumer differentials and boundaries are presumed in this comparison; the other variants of the area-price approach are ignored.

Regulation method and joint satisfaction of multiple goals

The first criterion against which the competing systems are compared is the ability to simultaneously satisfy the three policy goals. Preliminary comments on this criterion were offered in earlier chapters along with the analysis of the competing methods. The public-utility approach is designed to prevent exploitation of the consuming public by a producer insulated from meaningful competition. Traditionally it has

been used to adjust the distribution of income between the producing and consuming sectors of an industry. Its operation is limited to adjustments among gas users and producers; no opportunity exists within public-utility procedures to reflect values not represented by producing or consuming interests. Moreover, such factors as industry efficiency and the effect of regulation on the use rate of a depletable resource over time are necessarily extraneous to deliberations within the public-utility formula. They are not, however, isolated from side effects of policies designed merely to alter the distribution of income. Yet the nature and desirability of the side effects, being unintended and unplanned, cannot serve as decision constraints. The impact of the public-utility approach on variables making up the accepted social welfare function would bear no necessary relation to the direction of change leading to joint goal satisfaction.

The area-pricing method can be used to consider explicitly all the selected regulatory goals. The efficiency criterion is sustained because of the qualitative manner in which area-price regulation affects industry operations. In so far as conflicts exist between income distribution effects and use rates of natural gas, these conflicts can be compromised according to relative importance of the two goals and the maximizing area-price which would satisfy each. While the area-price method does not promise at all times to yield a solution which would correspond to the individual optimum price for both factors, a price could be chosen which would be optimal in the sense that any movement from that price would bring a net loss in welfare based on the values of the administrators. These results depend, of course, on the ability of the regulators to estimate both the goal satisfying prices and the relative importance of the goals. While in a practical sense the estimates would necessarily be crude, their crudity would be preferred to the absence of even such crude estimates under public-utility regulation.

Regulation method and changing conditions

One criterion for effective industry regulation is the ability to respond to altered conditions without loss of effectiveness in furthering the goals sought. Both the mere passage of time and unpredictable developments alter the socially desirable performance of a regulated industry such as natural gas production. For example, over time the quantity of natural gas in the ground will be reduced though the state of the industrial arts might change to the point where the economically available supply of gas might actually increase. Consumption patterns will change in response to altered resource patterns and demographic profiles. Similarly, events in competing and complementary industries might bring sudden shifts in the gas decision parameters. If regulation is to make its greatest contribution to the use of resources to bring maximum want satisfaction it must react appropriately to these and other altered conditions.

The public-utility method of regulation is essentially backward looking and historical in nature. No response to prospective changes in industry conditions is possible within the formula, nor is the method even capable of adjusting immediately to current conditions. Its response is geared instead to the present of a past which formed the record on which current regulatory decisions are made. The area-price method of regulation, on the other hand, is not tied to a given formula. It not only can react to changes, but can anticipate them as well. A hypothetical case can be used to demonstrate the difference in stimulus response of the two methods. Assume that a breakthrough in the costs of alternate sources of energy occurs which would make the gas industry obsolete. Under the public-utility method of regulation no change would occur in the established price of gas because the only factors which affect the price set on public-utility grounds are the cost of service and the rate of return to be earned by the operating firm. (In the decreasing cost portions of the industry the price might actually rise.) The gas would continue to be sold at its previous price, then, and the new industry would be encouraged to enter the fuels market,

displacing the high cost gas and bringing rapid scrapping of the fixed gas investment of producers, transporters, and consumers. Under the area-pricing approach, however, when the cost breakthrough for the competing fuel was accepted, the future value of gas reserves and of facilities for gas production, transportation, and consumption would be written off. With the writing off of the future value of alternative uses of the commodity natural gas and of the gas facilities the appropriate price for gas would fall to the current marginal cost figure. At this lower cost a larger portion of the effective life of the facilities and reserves would be utilized and the invasion by the alternate energy source would be delayed. Hence a greater total benefit would be derived from the sunk resources in the natural gas industry and total welfare would be increased in so far as additional gas would be consumed at its true alternative resource cost. Because the area-price method is not restricted to a formula the substance of which is established by historical data, the administrative agency following this method is capable of adjusting to anticipated shifts in decision parameters and is not the captive of possibly irrelevant constraints. On grounds of adaptability, therefore, the area-price method is more satisfactory than the public-utility method in regulating the dynamic natural gas production industry.

Regulation method and maximum firm self determination with social control

The greater the range of decisions over which the individual firm has control the more satisfactory the regulatory method if the requisite degree of social control can be maintained. Five reasons can be distinguished for wishing to minimize the role of the regulatory agency in operating industry decisions.

The first of these is that regulation of operations which includes review and initiation of action by the regulatory agency is expensive. Detailed reporting requirements, inspection activities, and supervision of routine operations raise the costs to both the supervisory agency and the supervised. Secondly, the lower the decision

level the greater the information and specialization which can be devoted to a particular job. Hence the expectation would be that decentralization of authority would lead to better, wiser, and more efficient operations so long as the decentralization was not carried beyond the point where fragmentation of authority brought scale diseconomies into play. Given a distribution of authority whereby a central agency made the industry decisions fraught with social interest, the operation of market discipline would assure reasonably desirable long run operations. The third reason for maximizing firm autonomy is that only through the diversity which would result would the full benefit of industrial initiative be secured. Experimentation is necessary for development of an industry, and that experimentation is fostered by incentives under which success is rewarded and failure punished. Minimum social interference with an industry consistent with the necessary assurances that the public interest be served not only opens the way for experimentation, but provides the incentive for it as well.

Two final reasons for maximizing firm self determination rest on the general presumptions for laissez faire. The greater the range for market decisions rather than authoritative decisions the less the probable sacrifice in welfare through unintended disruption of incidental economic elements. The relationships between economic variables are complex and devious; all of them cannot be considered directly by any administrative agency. Adjustments to regulatory changes made by individual economic decision centers could thus be expected to more nearly approach the welfare maximizing solution than would attempts at detailed social control of essentially peripheral matters. Private profit oriented actions, within a framework molding results to the desired pattern, would likely, then, yield an outcome socially preferred to that which could be instituted by direct regulatory measures. Along this same line, but on another tack, the traditional role of government in the United States has been popularly conceived as one of minimum intervention in private decision making. Whatever the merit of this view, it is widely held and a regulatory method which would minimize

the apparent direct regulatory activities of an agency for social control would be better received than one which would require a greater amount of such activity. For these reasons, then, the regulatory method which would impinge the least on the business decision process would be preferred to its alternative, and in this regard the strategic nature of the social control would be of less significance than its obviousness and its quantity.

The public-utility method and firm self determination

The public-utility method of regulation would require direct incursion of government into the operations of firms in the natural gas production industry. Each price set for gas must be set on a firm by firm basis and a different price must be set wherever conditions of sale differ. Since cost data are determining in each case, detailed examination of the operations and results of each firm is required for effective application of this method. Decisions on prices the firm is allowed to charge must be made, then, through a central agency which has both the information and the authority to formulate acceptable prices. Because of a combination of complexity of the task, difficulty of interpretation, and rigidity of method the opportunity for disagreement is large and hence judicial and other review is necessary before decisions are final. The encouragement to review procedures leads to further expenditures of time and resources and further incursions of the regulating process into the operations of the firm when the public-utility method is used.

Additional administrative activity accompanies regulation through the public-utility method because of the necessity for supervision to prevent service deterioration. There is little profit spur to full development of market potential if rates are based on costs and return is limited and somewhat protected through regulation. The firm has little stimulus for efficiency or for provision of adequate consumer service. Supervision of operations in the form of reviews of expenditures and initiation of service therefore follows public-utility type regulation designed to prevent exploitation of consumers.

The final factor by which the public-utility method of regulation impinges on the operation of individual firms is through the feedback effect of the regulation itself. The firm recognizes that its actions in the present will affect its revenues in the future in a way determined by the public-utility regulation device. Therefore present operating and investment decisions are judged by the firms in terms of their regulatory, not economic, implications. The mere presence of firm oriented regulation therefore distorts the decision making process away from the efficiency goal because firm profits depend on factors other than provision of efficient service to consumers.

The area-price method and firm self determination

Area-price regulation with value-to-consumer differentials requires administrative decisions on a different level than those following from the public-utility process. Area-price regulation exerts social control by altering strategic economic relationships to which private elements in the industry voluntarily conform. Firm by firm supervision is avoided, yet the social interest influences the distribution of income between sectors and the use rate of gas over time.

The nature of the operations required to institute area-pricing minimizes the necessary firm--agency interaction. Cost of production of natural gas enters into calculations only in estimating amounts supplied at various prices and in viewing alternative distributions of income. In no case is knowledge of the cost experienced by an individual firm necessary to the regulation process. Firm profits are likewise irrelevant to the determination of the base price, except as they are a factor in the income distribution and gas supply variables.

Commodity oriented industry contol provides an automatic profit incentive to the producing firm to maintain the most efficient and market-satisfying operations possible within economic limits. Since profits are tied directly to performance, the firm has an internal spur to socially desirable activity, obviating the need for direct supervision to secure similar response. Regulation feedback arising directly from

public-utility type regulation is avoided in that social control is divorced from the individual firm. Because the firm cannot significantly alter the industry values on which the regulatory parameters are set, it will look to enhancement of its own profit within the given framework. Profit is again, then, wedded to action which fulfills the general welfare.

The area-pricing method of regulation, in summary, leaves the firms with greater perceived autonomy than does the public-utility method, with no necessary sacrifice in social control. As the comments at the beginning of this section demonstrate, the advantages of the "one big decision" type regulation are all but obvious. The area-price approach to gas field sales regulation fulfills this administrative criterion better than the public-utility method, even if the differences in ability to achieve the substantive goals of regulation are ignored.

Regulation method and firm or area centered regulation

As contrasted to the general nature of the goals of regulation, some activity is directed more to the individual firm or production area than to the commodity or the industry as a whole. Income redistribution and production restriction are examples of policies which lead to firm centered regulation. The values leading to the goal of redistribution of income rest in some part on the judgment that whatever the nature of industry-wide profits, individual firms should not receive supra-normal returns because of fortuitous circumstances. Similarly, it is sometimes felt that firms should not be driven out of business and supply restricted because of high cost conditions in particular reservoirs where there is some socially defensible reason to maintain production. These elements of "just price" can be expressed only through specific action on the individual firm level. Regional monopoly based on location or other restrictions on entry into the industry also requires firm centered policies if regulatory goals are to be fulfilled.

The public-utility approach to regulation is well suited to taking elements affecting the individual firm and individual gas consumption area into consideration because the data of regulation and the direct impact of decisions are limited to the firm and its customers. While the cost-based approach cannot provide a broad view of regulatory issues, at the same time it can be applied precisely within its operational ambit. Area-price regulation using cost-based differentials approaches the specificity of the public-utility approach in redistributing income, though its orientation is to the gas production region rather than to the firm. As area-price with value-to-consumer differentials completely ignores the individual firm or area production costs and profits, it is completely unsuited for any regulatory task where particular cost or "just price" matters are important. To the extent that regulation variations by cost are both desirable and significant, then, the public-utility method of regulation is superior to the area-price method.

Regulation method and administrative certainty

Certainty, stability, and predictability are desirable elements of any social control of industry. If the private sector can plan with some degree of certainty that there will be no changes in the outward conditions which influence decisions then the regulation can be absorbed as an element of the decision matrix along with other industry facts. Legal issues are also more easily resolved if there is a body of decisions following essentially the same administrative law. Similarly, under established patterns of regulation a smaller degree of latitude is left to the administrators and therefore there is less opportunity for both disagreement and dissatisfaction with decisions made. Certainty, stability, and predictability, then, are characteristics to be desired in the social control of an industry. In a dynamic industry, on the other hand, administrative flexibility is also desirable.

The public-utility approach to gas field sales regulation provides stable and predictable regulation, whatever the desirability of

the decisions reached. This method is based on well settled principles and has been approved through judicial review. The procedures may well be time consuming and complex, but they can be settled with adequate administrative effort. Its administration depends on application of a given formula to the particular data observed in each case. Issues of interpretation arise, but they are circumscribed in nature and in practice reflect only minor differences in substance. All parties to regulation can predict within a given range of certainty the outcome of regulatory procedures using the method.

The area-pricing approach, on the other hand, is highly flexible. There is no established procedure and no certain administrative techniques which afford the cachet of tradition to decisions made under the area-price heading. Great latitude is therefore given to administrative agencies in determining the goals for natural gas production and use, and even more discretion is granted in administering the area-price and the price differentials in order to attain these goals. Similarly, changes over time which affect the substantive goals of regulation or affect the variables controlled to reach those goals would evoke unpredictable reactions from the administering agencies because of the absence of already determined decision parameters. While the flexibility of the area-pricing approach to social control of the field sales of natural gas has advantages in serving the total interest, this very adaptability leaves the industry and its consumers unable to plan on regulatory stability or to predict response to given variations in significant elements. On these practical grounds, then, the area-pricing approach is inferior to the mere application of the public-utility formula to the data of industry experience.

Regulation method: conclusions on effective regulation at the operational level

Conflict exists among some of the elements by which the effectiveness of regulation on the operational level is judged. For example, while administrative certainty is valued, at the same time the ability to respond appropriately to changing conditions is likewise desired. Complete fulfillment of all criteria is therefore foreclosed because

the criteria themselves are to some extent in conflict. It is only within the limits of the possible, then, that regulatory methods can be meaningfully judged.

The area-pricing approach with value-to-consumer differentials meets the operational tests of making joint goal maximization possible, adapting to changing conditions, and maximizing firm self determination. The area-pricing method fails at firm-centered regulation. While the area-pricing approach can be stabilized, the flexibility of the method and the discretion left to the administrators violates what is generally thought of as administrative certainty. The firm by firm cost approach typical of the public-utility method is consistent with these latter two criteria but does not adequately provide for other administrative desiderata. A choice between the two methods on these grounds, then, can only come as the relative importance of the five subsidiary criteria are assayed. These comparisons are foreign to analysis and can only take place within the evaluative process itself. The operational evaluation of the two regulatory methods must be joined to the substantive results of the rest of this study to provide a complete picture of the choice between area-price and public-utility regulation.

The Commodity Unit Tax as a Supplement to Area-Price Regulation

The use of a uniform unit tax on consumption as a supplement to the area-price method of regulation was suggested to bring the amount of gas supplied and demanded into equality at the chosen area-price.[1] It was noted above that this commodity imbalance was encountered whenever different economic results were imposed on unchanged conditions.

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[1]The uniform unit tax on consumption was first discussed in Chapter VIII above where the operation of tax was described. As conceived, the tax might be either positive or negative (a consumption subsidy) according to the direction of movement desired for the demand schedule. A reduction in demand (a positive tax) was used as the illustrative example discussed here on grounds that private costs of production were not indicative of the alternative costs of current consumption compared to future consumption, at least in the probable view of regulatory authorities.

The matter is not unique, then, to area-price regulation, though perhaps it is more obviously a problem with this method than with cost-based regulation. Three methods of dealing with the expected commodity imbalance from regulation were presented above. The first two of these, direct end-use control and private, nonprice gas rationing, were found to be capable of adjusting amounts supplied and demanded but at a greater economic and administrative cost than the unit tax method. Conclusions concerning use of a unit tax are summarized in the paragraphs below.

A unit tax on consumption could bring the marginal private costs of current gas consumption into equality with the marginal social cost of current gas consumption (including the alternative of future consumption). If a positive tax were indicated, the shift upward of the experienced price of gas to consumers would restrict gas use. At the same time, the area-price relevant to the suppliers could be established at the level necessary to bring forth a quantity of gas equal to the desired consumption level. Hence the unit tax in conjunction with the area-price could bring amounts supplied and demanded into equality at a field price which would reflect the private costs of production and at a consumption price that would reflect the social costs of consumption. Without the unit tax supplement to area-price regulation, compromise between the goals of appropriate income distribution and desired use rate of natural gas is inevitable unless a single area-price coincidentally fulfills both goals.[2] The use of a unit tax severs the connection between the quantity of gas consumed and the area-price received by the producers. The independence of quantity consumed and field price allows the regulating agency to maximize the satisfaction of both substantive goals and therefore raises the potential gains from regulation.

The use of the unit tax on gas consumption to adjust amounts supplied and demanded does not conflict with efficient allocation of

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[2]This compromise is possible, while not optimal, under area-price regulation. A price can be selected and verified (given value judgments) to bring greater total welfare than another price. Such verification is impossible using the cost-based method of regulation.

either natural gas or production factors. The reliance on market allocation enhances higher value uses of gas and lower cost production. The willingness of one consumer to pay a higher price than a potential consumer will pay indicates, presumably, a higher short run contribution to economic welfare of the gas to the one than to the other. Over time, as all costs became variable for both the consumer and the prospective consumers, the assumption could be extended to the conclusion that gas would flow to higher long run economic uses as well. Similarly, mobile production resources would migrate to least cost operations. This shift of productive factors in response to market pressure would tend toward efficiency in the producing sector of the industry. Hence the commodity unit tax as a supplement to area-price regulation would not upset the efficiency goal of gas regulation.

The unit tax on natural gas consumption does not inject additional regulatory supervision into the operations of producers or consumers of natural gas. In the nature of the control exerted, the tax on consumption is much like the area-price itself. The regulator selects a tax rate and the consumers are allowed to adjust to it in any way they see fit, just as producers adjust to the externally imposed area-price. No direct administrative link (except enforcement) is required between regulator and regulated and thus the administrative advantages of the area-price method are retained with the addition of the commodity tax supplement. The coverage of the consumption tax and the area-price itself, however, raises some economic questions. Gross distortions of consumption and production in the industry would result if some production and consumption were regulated while other production and consumption was not. Just this condition exists given the currently circumscribed jurisdiction of federal regulation under the Natural Gas Act. Since a statutory provision alone is involved, extension of federal control to intrastate production and consumption would not require a basic revision in national policy. It would require, however, a shift in the role of the FPC, the gas regulating agency under current legislation.

The Role of the FPC in Gas Sales Regulation

The traditional role of the independent regulatory commission has been to use its administrative and technical skills to apply settled, invariant policy to specific circumstances. This description applies to some of the functions of the FPC. It has become obvious over the course of this study, however, that regulation of the sale of gas for resale in interstate commerce requires a different and broader role from the regulating agency if effective regulation is to be achieved. Even presuming that the general nature of regulatory goals is derived from the social consensus, three functional levels of gas industry regulation remain. First, the relative importance and substantive content of each goal selected must be determined. Secondly, the means to express these values must be found, and finally, the administration of the regulation decided upon to bring about the desired ends is necessary. The conclusion that the necessary role of the FPC includes policy as well as administrative functions, that is the first two above as well as the third, rests on the essential nature of gas regulation and on the practical alternatives available.

Policy matters in gas regulation at the field level

The substantive content which goes into the goals for regulation, and the regulatory procedures which express that content, are policy matters in regulation. The goals of regulation cut across value lines in evoking policy decisions. The appropriate use rate for gas cannot be derived from analysis, though some contribution can be made in making costs of any action explicit. Similarly, regulation requires a decision as to the amount of passively derived income which will be allowed to accrue to the owners of rights to produce natural gas in the field. Further, while there is no goal conflict over the issue of increased welfare through greater efficiency, its achievement raises the issue of the desirable rapidity and nature of the adjustment from one pattern of resource production and use to another. Any shift in production and use will lead to windfall gains and losses. The disruption resulting from

these changes is a cost of the gains received from greater efficiency. The specific policy and value decisions in industry regulation must be made by the regulatory agency, whether or not the framework of regulation is based on social consensus.

Actual gas regulation, whatever the method used, consists in the end of altering both gas price and quantities produced and consumed. The alteration may be achieved by either direct or indirect methods, but it is present if social control goes beyond mere policing of market determined agreements. Administration of this control in the interest of attaining given goals for the natural gas production and sales industry requires flexibility at the policy level. That is, the appropriate measures to fulfill the given goals could not necessarily be derived from the application of pre-established procedures to changing conditions. A change in industry or economy conditions can be expected to disrupt the relationships between critical variables if multidimensional substantive goals are sought. Thus new procedures as well as new price--quantity measures would be required if the maximum satisfaction of the joint goals were obtained under changed conditions. The conclusion follows, then, that to assure effective social control of field sales of natural gas more regulative flexibility is needed than can be built into predetermined reactions to anticipated stimuli. The authority to alter procedure and policy is therefore necessary to secure even predetermined and settled goals. Methods and procedures cannot, then, be set up and blindly applied over time with a reasonable expectation that their application will lead to the ends desired.

Governmental level and regulatory role

The regulation of the field sales of natural gas for resale in interstate commerce in the United States conceptually is divided into four functional levels. The highest level might be termed the social consensus, the explicit or implicit expression of the sovereignty of the citizenry. The second level molds this consensus into a specific goal structure. Conversion of accepted goals into specific regulatory measures designed to achieve the stated goals is the third functional level

in the exertion of social control. Finally, the administration of regulatory measures at the industry level brings the policy determinations to bear on individual firms and consumers. The allocation of responsibility in the United States governmental structure has been traditionally conceived to place the policy making function in the hands of Congress and to restrict the independent regulatory commissions to an administrative and quasi-judicial, but not policy making, role. Given the nature of the type of gas industry regulation considered in this study, however, the conclusion is reached that Congress is practically, if not conceptually, incapable of satisfactorily providing the policy direction required.

The second and third functional levels described above are policy making in nature and hence would rest on Congress under the traditional division of authority and responsibility. The selection of goals and the relative importance which is attached to each of those goals in conflict situations is a matter within Congressional competence. The goals themselves are not likely to shift markedly over reasonable periods of time, and the Congress is the body with the responsibility of reflecting the consensus of the electorate from which basic values flow. The task of expressing the general goals of the community is likewise a task which would not require either technical knowledge of the industry regulated nor detailed and continuing study beyond the limits of Congressional resources.

The actual balance between conflicting goals and the maximizing content to be placed in each, however, is less suited to Congressional determination. The interactions between goals and between actions in one portion of the economy and those in another are exceedingly complex and important. Full understanding of these relationships requires detailed consideration of an enormous range of material. The Congress, faced with its myriad responsibilities, must allocate its limited capacity for decision making to those matters with a higher priority on its attention. The shifts in conditions accompanying the passage of time reinforce this restraint on detailed Congressional determination of goal content. The gas industry changes, as does the rest of the economy.

A mutual adjustment of dynamic factors is therefore required for effective regulation. The determination of proximate goals in gas industry regulation, then, is a constant process and Congress is not equipped or able to devote continuing attention to this one problem among the many reaching its attention. In summary, Congress, while it can influence the specific content of the goals sought for the general welfare, and while it can retain a passively permissive control over those decisions, cannot specify the content of regulatory goals.

The third function of regulation is the creation of methods which, when applied, yield the desired ends. Because of the nature of regulation of the field sales of natural gas, the conclusion was drawn above that methods of regulation must be flexible. The choice of methods of regulation requires familiarity with special factors in industry operation as well as a clear conception of the ends sought. In the practical sense, Congress is unable to provide the expert knowledge necessary to formulate regulatory methods for any one time, and is certainly unable to revise periodically the methods of regulation to provide the requisite flexibility. For these reasons these policy matters cannot be left to the traditional policy making level of government in the United States, the legislative branch.

The discussion above points to the conclusion that the Congress is not capable of making all policy decisions with reference to natural gas industry regulation. The options remaining, if this conclusion is accepted, are inferior regulation through Congressional policy formation to the best of its ability, a policy making role for the FPC, or no regulation at all. If the option of effective regulation is chosen, and it would be following the value judgments underlying the assumptions accepted in this study, the role of the FPC could be divided into its administrative and its policy functions. The Commissioners would operate at the policy level and the Staff would administer accepted policies. Congress could retain its power of review at its own initiative. While this arrangement would to some degree alter the traditional division of authority among governmental levels in the United States, it would not void the substantive goal of maintaining responsible and

responsive social control over economic activities peculiarly affected with the public interest.

Substantive Conclusions on Federal Regulation of Sales for Resale of Natural Gas in Interstate Commerce

The major substantive finding of this study is that the area-price method of federal regulation of the field sales for resale of natural gas in interstate commerce more nearly fulfills the selected public policy goals than does the public-utility method. In some particulars, however, the method as proposed by the FPC in the current proceedings is not optimal. The public-utility approach is unsatisfactory in absolute terms as well. It is further concluded that the choice between laissez faire and area-price regulation rests on estimates of costs and benefits not susceptible to analytical resolution. The comparative analysis of regulatory methods was limited to the three alternatives (area-price, public-utility, and laissez faire) to which most public attention has been given, and the range of these conclusions is therefore likewise restricted.

The second substantive finding is that effective regulation must consider both the quantitative and the price effects generated in the industry. The uniform tax on consumption is suggested as a supplement to the area-price approach. It is concluded that this combination would most efficiently and satisfactorily adjust the quantitative and price elements of regulation. The third substantive conclusion from this study is that the role of the FPC must be enlarged to include explicit policy formation on both the ends and means levels. Inferior regulation results if the Commission is not allowed to exercise its competence in this way.

The final conclusion on a substantive matter is that federal regulation of the natural gas industry at the field sales level would not be maximally effective unless FPC jurisdiction were widened to include intrastate sales and direct industrial sales interstate. Of the two, the latter is the most important. Area-price regulation can be administered over the current FPC jurisdiction, but marginal

distortion of the producing and consuming portions of the industry will result. The present distribution of jurisdiction between the federal and the state governments has no necessary economic justification, whatever its political rationale. No apparent Constitutional obstacles to wider federal jurisdiction exist, though such an expansion of jurisdiction would require statutory revision.

Conclusions on the Approach Followed in This Study

This study of the federal regulation of the field sales of natural gas was designed to test the hypothesis that a formal analytical approach to public policy could yield useful results. The specific task set in this work was to determine if it were possible to select goals for natural gas industry regulation and then to evaluate regulatory policy options on grounds of success in fulfilling these goals. The previous section reports the success in fulfilling this aim. The range of possible disagreement in policy formation in the natural gas industry was reduced and social welfare was potentially enhanced by the application to this problem of the techniques described above.

The hypothesis that formal analysis could yield conclusions useful in policy formation was not rejected by the findings of this study. Throughout the study the evaluation rested on nonquantified parameters to heighten the level of abstraction and to minimize the impact of any specific assumptions introduced. The level of abstraction attained by this restraint justified the subsidiary conclusion that the finding did not depend on specification of the content of the quantitative goals chosen. The formal demonstration of this result, if verified in subsequent research, reduces by a significant degree the indeterminacy of the regulatory process.

The goals selected were crucial to the results obtained in this study. The findings in this study do not preclude the rejection of the hypothesis if other goals are selected or if other methods of regulation are considered. Such rejection in other instances would threaten only the scope of the applicability of these techniques, however, not the

advantages from their use in specific cases. The similarity of the process of regulation, whatever the method, and the qualitative resemblance of different goals, argue that further research would support the finding that an appropriate approach would allow value-free choice between alternative means of accomplishing predetermined public policy goals.

The conclusions reached in this study lead to two broad areas of further research, the first related to natural gas field sales regulation and the second to the general nature of regulation by independent commission. Empirical verification of the substantive conclusions reached in this study is the most immediate subject for further examination. If quantified content were assumed for the regulatory goals, a determination could be made as to whether the area-price approach would result in the desired level of gas consumption, the selected intersector distribution of income, and the lowest resource cost per unit of consumer satisfaction. A similar study with different regulatory goals would test the general applicability of the techniques used but could neither support nor threaten the substantive conclusions reached above. Such research is needed, to expand the verified range of applicability of formal analysis of field sales regulation by means of these comparative techniques. By the same token, the testing of different possible methods with either the same or different goals is required before the full benefits in public economic policy formation can be derived from this study.

The crisis in regulation by the independent commission was remarked upon in Chapter I. The conclusions reached in this study suggest that further research of a similar type would add to the understanding of commission regulation in industries of a different nature. For example, it appears that one of the causes of the breakdown in FPC regulation of the sales of natural gas at the field level was the lack of a clear conception of the goals sought by regulation. The specific formulation and statement of goals in this study resulted in restricting the areas of disagreement over methods of achieving the ends in view. Once goals were specified for the other regulatory agencies the

administrative problems which currently appear unsolvable might similarly prove amenable to efficient and value-free resolution. Another finding of this study, that effective regulation of the gas industry requires the FPC to take an active policy making role, might have wide application. As the historical and institutional material found in Chapters V, VII, and VIII implied, the ambiguous role orientation of the FPC has led to confused and conflicting action which has not been efficiently directed to a given end. Greater administrative flexibility was also indicated as a need if adjustments were to keep up with the changes in the regulated industries. Research such as that suggested above would complement this study and would further test the general applicability of the conclusions reached here.

BIBLIOGRAPHY

BIBLIOGRAPHY

Books

American Gas Association. Gas Facts: A Statistical Record of the Gas Utility Industry in 1960. New York: American Gas Association, 1961.

_____. Historical Statistics of the Gas Industry. New York: American Gas Association, 1954.

American Petroleum Institute. Petroleum Facts and Figures, Centennial Edition, 1959. New York: American Petroleum Institute, 1959.

_____. Petroleum Facts and Figures, 1961 Edition. New York: American Petroleum Institute, 1961.

Craft, B. C., and Hawkins, M. F. Applied Petroleum Reservoir Engineering. Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1959.

Little, I. M. D. A Critique of Welfare Economics. Oxford Paperback 2d ed. London: Oxford University Press, 1960.

Mac Avoy, Paul W. Price Formation in Natural Gas Fields: A Study of Competition, Monopsony, and Regulation. New Haven, Connecticut: Yale University Press, 1962.

Myint, H. L. A. Theories of Welfare Economics. Cambridge, Massachusetts: Harvard University Press, 1948.

Netschert, Bruce C. The Future Supply of Oil and Gas. Baltimore: The Johns Hopkins Press, for Resources for the Future, 1958.

Neuner, Edward J. The Natural Gas Industry: Monopoly and Competition in Field Markets. Norman, Oklahoma: University of Oklahoma Press, 1960.

Rothenberg, Jerome. The Measurement of Social Welfare. Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1961.

Summers, W. L. The Law of Oil and Gas. 8 vols. Kansas City: The Vernon Law Book Company, 1954.

Thompson, C. Woody, and Smith, Wendell R. Public Utility Economics. New York: McGraw-Hill Book Company, Inc., 1941.

U.S. Department of Commerce, Bureau of the Census. Historical Statistics of the United States, Colonial Times to 1957. Washington: Government Printing Office, 1960.

U.S. Department of the Interior, Bureau of Mines. Minerals Yearbook, 1928-1960. Washington: Government Printing Office, 1929-1961.

Zimmermann, Erich W. World Resources and Industries. Rev. ed. New York: Harper and Brothers, 1951.

Articles

Allen, C. M. "Depth makes a difference in the search for Natural Gas," Oil and Gas Journal, LIX, No. 17 (April 24, 1961), 103.

"Area-Pricing Talks Fizzle," Oil and Gas Journal, LIX, No. 17 (April 24, 1961), 82.

"Area Pricing Ground Rules Are Tough to Write," Oil and Gas Journal, LIX, No. 16 (April 17, 1961), 86.

Burgess, Kenneth F. "The Twilight Zone Between the Police Power and the Commerce Clause," 15 Iowa Law Review 162 (1930).

Butler, Ira. "The Texas Market Demand Statute and the Experiences in Its Application to Practical Conditions," The Interstate Oil Compact Commission Bulletin, II (December, 1960), 1-14.

Cookenboo, Leslie, Jr. "Competition in the Field Market for Natural Gas," The Rice Institute Pamphlet, XLIV, No. 4 (January, 1958), 1-123.

Davis, E. J., Jr. "Early History of Market Demand in Oklahoma," The Interstate Oil Compact Commission Committee Bulletin, II (June, 1960), 21-22.

"Don't Count Out Area Gas Pricing Yet," Oil and Gas Journal, LIX, No. 35 (August 28, 1961), 40-41.

"First Round in Area Pricing Is a Draw," Oil and Gas Journal, LIX, No. 11 (March 13, 1961), 84-86.

"FPC Asks Help on Gas Pricing for South Louisiana," Oil and Gas Journal, LIX, No. 27 (July 3, 1961), 80-81.

German, W. P. Z. "Legal History of Conservation of Oil and Gas in Oklahoma," Legal History of Conservation of Oil and Gas, A Symposium. Chicago: American Bar Association, Section of Mineral Law, 1938, 110-213.

Hardwicke, Robert E. "Oil Conservation: Statutes, Administration, and Court Review," 13 Mississippi Law Journal 386 (1941).

_____. "Texas, 1938-1948," Conservation of Oil and Natural Gas, A Legal History, 1948. Edited by Blakely M. Murphy. Chicago: American Bar Association, Section of Mineral Law, 1949, 447-514.

Lee, Arthur K. "Gas Confusion Unlimited," Public Utilities Fortnightly, LXVI, No. 7 (March 31, 1960), 443-55.

_____. "Introducing Supply and Demand Control for Gas Producer Regulation," Public Utilities Fortnightly, LXVII, No. 6 (March 16, 1961), 369-75.

_____. "Producer and Gas Pipeline Yardsticks," Public Utilities Fortnightly, LXIII, No. 7 (March 26, 1959), 451-61.

"Marsh Advises FPC to Dump Area Pricing," Oil and Gas Journal, LIX, No. 33 (August 14, 1961), 84.

Mason, John C. "Producer Problems Under the Natural Gas Act," Public Utilities Fortnightly, LXVIII, No. 7 (September 28, 1961), 512-18.

Masterson, Wilmer D., Jr. "A Survey of Basic Oil and Gas Law," Fourth Annual Institute on Oil and Gas Law and Taxation. Dallas, Texas: Southwestern Legal Foundation, 1953, 219-77.

McCreery, Donald C., "The Legal Consequences of the Interstate Natural Gas Company Decision and Related Cases," 19 Mississippi Law Journal 153 (1948).

McKie, James W., and McDonald, Stephen L. "Petroleum Conservation in Theory and Practice," Quarterly Journal of Economics, LXXVI (February, 1962), 98-121.

"Natural gas had best year ever," Oil and Gas Journal, LXIX, No. 4 (January 28, 1963), 168-69.

Newcombe, Marshall. "Federal and State Regulation of Gas Utilities," First Annual Institute on Oil and Gas Law and Taxation. Dallas, Texas: Southwestern Legal Foundation, 1949, 97-148.

"Oil men concerned, but hopeful," Oil and Gas Journal, LX, No. 3 (January 15, 1962), 59.

"Permian Hearing Told: Gas Producers Must Have Incentive," Oil and Gas Journal, LIX, No. 42 (October 16, 1961), 62.

"Permian price approach irks producers," Oil and Gas Journal, LX, No. 48 (November 26, 1962), 52-53.

Pollis, Adamentia, and Koslin, Bertram L. "On the Scientific Foundations of Marginalism," The American Journal of Economics and Sociology, XXI, No. 2 (April, 1962), 113-30.

Stocking, George W., and Mueller, Willard F. "The Cellophane Case and the New Competition," American Economic Association Readings in Industrial Organization and Public Policy. Edited by Heflebower and Stocking. Homewood, Illinois: Richard D. Irwin, Inc., 1958. Vol. VIII, 118-50.

Stueck, Frederick. "Current Factors in Gas Producer Rate Cases," Public Utilities Fortnightly, LXV, No. 3 (February 4, 1960), 145-53.

Thompson, Ernest O. "The Oil and Gas Market Demand Law," The Interstate Oil Compact Commission Committee Bulletin, II (June, 1960), 13-15.

Vermetten, J. B., and Plantinga, J. "The Elasticity of Substitution of Gas with Respect to Other Fuels in the United States," Review of Economics and Statistics, XXXV (May, 1953), 140-43.

Wellisz, Stanislow H. "The Public Interest in Gas Industry Rate Structures, Part I," Public Utilities Fortnightly, LXX, No. 2 (July 19, 1962), 65-78.

_____. "The Public Interest in Gas Industry Rate Structures, Part II," Public Utilities Fortnightly, LXX, No. 3 (August 3, 1962), 145-56.

"World Trends," World Oil, CLIII (August, 1961), 72-73, 76.

Public Documents

American Republics Corporation, 7 F. P. C. 952 (1948).

Area Rate Proceeding, Docket No. AR61-1; Claude E. Aikman, Docket No. G-18466; North Central Oil Corporation (Operator), Docket No. CI60-435. Order Instituting Area Rate Hearing, Consolidating Proceedings and Prescribing Preliminary Procedure, 24 F. P. C. 1121 (1960).

Area Rate Proceeding, Docket No. AR61-1; Claude E. Aikman, Docket No. G-18466; North Central Oil Corporation (Operator), Docket No. CI60-435. Order Ruling upon Motion Relating to Evidence to Be Considered in Area Rate Proceeding, 25 F. P. C. 614 (1961).

Area Rate Proceeding, Docket No. AR61-1; Claude E. Aikman, Docket No. G-18466; North Central Oil Corporation (Operator), Docket No. CI60-435. Order Requiring that Certain Data Be Filed, Directing that Said Data Be Placed in Proper Form and Presented in Evidence, Setting Date of Hearing, Prescribing Procedures for Said Hearing and Ruling on Motion and Appeal, 26 F. P. C. 247 (1961).

Area Rate Proceeding, Docket No. AR61-2; Aladdin Exploration Company, Inc., Docket No. CI61-1564; Amerada Petroleum Corporation, Docket No. RI60-18. Order Instituting Rate Proceeding for the Southern Louisiana Area, Consolidating Proceedings and Prescribing Preliminary Procedure, 25 F. P. C. 942 (1961).

Area Rate Proceeding, Docket No. AR61-2; Aladdin Exploration Company, Inc., Docket No. CI61-1564; Amerada Petroleum Corporation, Docket No. RI60-18. Order Upon Presiding Examiner's Report Prescribing Procedure and Denying Motion, 26 F. P. C. 723 (1961).

Burns' Annotated Indiana Statutes (1933), pars. 10-1407--10-1409.

Compiled Laws of Michigan (1929), c. 223.

Darts Louisiana General Statutes Cumulative Annual Supplement (1937).

Federal Power Commission. Fifteenth Annual Report, 1935--Forty-Second Annual Report, 1962. Washington: U.S. Government Printing Office, 1936-63.

_____. Natural Gas Investigation, Docket G-580. Washington: U.S. Government Printing Office, 1948.

General Crude Oil Company, 7 F. P. C. 1024 (1948).

Hassie Hunt Trust, 6 F. P. C. 835 (1947).

Houston Oil Company of Texas, 7 F. P. C. 953 (1948).

Humble Oil and Refining Company, 7 F. P. C. 954 (1948).

In the Matter of Amere Gas Utilities Company, 15 F. P. C. 781 (1956).

In the Matters of Atlantic Seaboard Corporation and Virginia Gas Transmission Corporation, 11 F. P. C. 43 (1952).

In the Matter of Billings Gas Company, Ohio Oil Company, and Mountain Fuel Supply Company, 2 F. P. C. 288 (1940).

In the Matter of Canadian River Gas Company, Colorado Interstate Gas Company and Colorado-Wyoming Gas Company, 3 F. P. C. 32 (1942).

In the Matters of Columbian Fuel Corporation, 2 F. P. C. 200 (1940).

In the Matters of Deep South Oil Company of Texas, Humble Oil and Refining Company, Shell Oil Company, Opinion and Order Affirming Examiner's Decision, 14 F. P. C. 83 (1955).

In the Matters of Deep South Oil Company of Texas, Humble Oil and Refining Company, Shell Oil Company, Upon Petition for Orders to Remove Uncertainties as to Stays, 14 F. P. C. 309 (1955). Edward B. Marsh, Presiding Examiner.

In the Matter of Interstate Natural Gas Company, Inc., 3 F. P. C. 416 (1943).

In the Matter of Michigan-Wisconsin Pipe Line Co., 6 F. P. C. 1 (1947).

In the Matter of Panhandle Eastern Pipe Line Company, 13 F. P. C. 53 (1954).

In the Matter of Phillips Petroleum Co., 7 F. P. C. 983 (1948).

In the Matter of Phillips Petroleum Company: Decision upon Consolidated Proceeding under Sections 4 (e) and 5 (a) of the Natural Gas Act to Determine Just and Reasonable Rates for an Independent Producer, Docket G-1148, 24 F. P. C. 590 (1959).

In the Matter of Phillips Petroleum Company, Proceedings to Determine Whether Phillips Petroleum Company Is a "Natural Gas Company" as Defined in the Natural Gas Act, Docket G-1148, 10 F. P. C. 246 (1951).

Kansas General Statutes, 1949, 1959 Supplement, Ed. Franklin Corrick, c. 55.

Kansas General Statutes, Annotated, 1949, Ed. Franklin Corrick, c. 55.

Kansas-Nebraska Natural Gas Company, 6 F. P. C. 664 (1947).

LaGloria Corporation, 7 F. P. C. 349 (1948).

Louisiana, Revised Statutes of 1950, Vol. III, Title 30.

Northern Natural Gas Company, 11 F. P. C. 174 (1952).

Northern Natural Gas Company, 12 F. P. C. 66 (1953).

Northern Natural Gas Company, Opinion 230, 11 F. P. C. 400 (1952).

52 Oklahoma Statutes Annotated.

Opinion and Order Determining Cost of Service and Terminating Proceedings, Phillips Petroleum Company, 24 F. P. C. 537 (1960).

Order on Appeal to the Commission from Certain Rulings of Presiding Examiner with Respect to the Admissibility of Evidence, 12 F. P. C. 840 (1953).

Order Vacating Termination of Proceedings and Continuing Investigation, Phillips Petroleum Company, 13 F. P. C. 1527 (1954).

Sinclair Prairie Oil Company, 6 F. P. C. 1059 (1947).

Statement of General Policy No. 61-1 Establishment of Price Standards to Be Applied in Determining the Acceptability of Initial Price Proposal and Increased Rate Filings by Independent Producers of Natural Gas, 24 F. P. C. 818 (1960).

The Superior Oil Company, 7 F. P. C. 627 (1948).

Texas Civil Statutes (Vernon, 1929), Art. 6014.

Texas Civil Statutes (Vernon, 1948), Arts. 6008, 6008a, 6014, 6014a, 6020, 6049a, 6049b, 6049c, 6049d.

U.S. House, H.R. 4566 (Harris), 84th Cong., 1st Sess., 1955.

U.S. Senate, S. 1853 (Fulbright), 84th Cong., 1st Sess., 1955.

U.S. Senate, Committee on the Judiciary, Subcommittee on Administrative Practice and Procedure. Report on Regulatory Agencies to the President-Elect. Prepared by James M. Landis, 86th Cong., 2d Sess., 1960.

U.S. Senate, Federal Trade Commission. Utility Corporations: Final Report to the Senate of the United States on Economic, Corporate, Operating, and Financial Phases of the Natural-Gas Producing, Pipe-line, and Utility Industries, with Conclusions and Recommendations, Document 92, Part 84-A, 70th Cong., 1st Sess., 1936.

U.S. House of Representatives, Committee on Interstate and Foreign Commerce. Regulation of Stock Ownership in Railroads. Pursuant to House Resolution 114, 71st Cong., 3d Sess., 1931.

U.S. House of Representatives, Committee on Interstate and Foreign Commerce. Relation of Holding Companies to Operating Companies in Power and Gas Affecting Control. Printed as H.R. 827, 73d Cong., 2d Sess., 1934.

U.S. Senate, Senate Joint Resolution 115, 73d Cong., 2d Sess., 1934.

U.S. Senate, Senate Resolution 83, 70th Cong., 1st Sess., 1928.

U.S. Statutes at Large. Vol. XLI.

U.S. Statutes at Large. Vol. XLVI.

U.S. Statutes at Large. Vol. XLIX.

U.S. Statutes at Large. Vol. LII. (Natural Gas Act)

Legal Citations

Amazon Petroleum Corporation v. Railroad Commission of Texas, 5 F. Supp. 633 (D.C. Tex., 1934).

Bandini Petroleum Co. v. Superior Court, 284 U.S. 8 (1931).

Bluefield Water Works and Improvement Company v. Public Service Commission, 262 U.S. 679 (1923).

The Butchers' Benevolent Association of New Orleans v. The Crescent City Livestock Landing and Slaughterhouse Company, 16 Wallace 36 (1872).

C. C. Julian Oil and Royalties Co. v. Capshaw, 292 P. 841 (Okla. Sup. Ct. 1930).

Champlin Refining Company v. Corporation Commission of Oklahoma, 286 U.S. 210 (1932).

Cities Service Gas Co. v. State Corporation Commission, 304 P. 2d 528 (Sup. Ct. Kan. 1957).

Cities Service Gas Co. v. Peerless Oil and Gas Co., 340 U.S. 179 (1950).

Cities Service Gas Co. v. Peerless Oil and Gas Co., 220 P. 2d 279 (Sup. Ct. Okla. 1950).

City of Detroit v. Federal Power Commission; County of Wayne, Michigan v. Federal Power Commission, 230 F. 2d 810 (C.A.D.C. 1955). (Certiorari denied, 351 U.S. 829 1956).

Colorado Interstate Gas Co. v. Federal Power Commission, 324 U.S. 581 (1945).

Comanche Duke Oil Co. v. Texas and Pacific Coal and Oil Co., 298 S.W. 554 (Tex. Comm. of App. 1927).

Continental Oil Company v. Federal Power Commission, 247 F. 2d 904 (5th Cir. 1957).

Cooley v. Board of Wardens, 12 Howard 299 (1851).

Corzelius v. Railroad Commission, 182 S.W. 2d 412 (Tex. Civ. App. 1944).

Danziger Oil and Refining Co. of Texas v. Railroad Commission of Texas, 56 S.W. 2d 1075 (Sup. Ct. Tex. 1933).

Danziger Oil and Refining Co. of Texas v. Railroad Commission of Texas, 49 S.W. 2d 837 (Tex. Civ. App. 1932).

Deep South Oil Co. v. Federal Power Commission, 247 F. 2d 882 (5th Cir. 1957).

Denver Producing and Refining Co. v. State, 184 P. 2d 961 (Okla. Sup. Ct. 1947).

East Ohio Gas Co. v. Tax Commissioner of Ohio, 283 U.S. 465 (1931).

Elliff v. Texon Drilling Co., 210 S.W. 2d 558 (Tex. Civ. App. 1948).

Elliff v. Texon Drilling Co., 216 S.W. 2d 824 (Tex. Civ. App. 1948).

El Paso Natural Gas Co. v. F. P. C., 281 F. 2d 567 (5th Cir. 1960).

Federal Power Commission v. Hope Natural Gas Co., 320 U.S. 591 (1944).

Federal Power Commission v. Panhandle Eastern Pipe Line Company, 337 U.S. 498 (1949).

Hague v. Wheeler, 157 Pa. 324 (1893).

Henderson v. Thompson, 300 U.S. 258 (1937).

Houston, East and West Texas Railway Company v. United States, 234 U.S. 342 (1914).

Humble Oil and Refining Company v. Federal Power Commission, 247 F. 2d 903 (5th Cir. 1957).

Humble Oil and Refining Company v. Federal Power Commission, 355 U.S. 930 (1958).

Interstate Natural Gas Co. v. Public Service Commission, 34 F. Supp. 50 (D.C. La. 1940).

Interstate Natural Gas Co. v. Public Service Commission, 33 F. Supp. 980 (D.C. La. 1940).

Interstate Natural Gas Co. v. Federal Power Commission, 331 U.S. 682 (1947).

Kansas-Nebraska Natural Gas Co. v. State Corporation Commission, 222 P 2d 704 (Sup. Ct. Kan. 1950).

Louisville Gas Co. v. Kentucky Heating Co., 77 S.W. 368 (Ky. Ct. App. 1903).

McCoy v. Arkansas Natural Gas Co., 165 So. 632 (La. Sup. Ct. 1936).

MacMillan v. Railroad Commission of Texas, 51 F. 2d 400 (W.D. Tex. 1931).

Missouri v. Kansas Natural Gas Company, 265 U.S. 298 (1924).

Natural Gas Pipeline Company v. Panoma Corporation, 349 U.S. 44 (1958).

New Orleans Gas Company v. Louisiana Light Company, 115 U.S. 650 (1885).

Ohio Co. v. Indiana, 177 U.S. 190 (1900).

Opinion of the Justices, 150 Mass. 592 (1890).

Peik v. Chicago and Northwestern Railway Company, 94 U.S. 164 (1876).

Pennsylvania v. West Virginia, 262 U.S. 553 (1923).

Peoples Natural Gas Co. v. Federal Power Commission, 127 F. 2d 153 (C.A.D.C. 1942).

Phillips Petroleum Co. v. Oklahoma, 340 U.S. 190 (1950).

Phillips Petroleum Company v. Wisconsin, 347 U.S. 672 (1954).

Public Utilities Commission of Rhode Island v. Attleboro Steam and Electric Co., 273 U.S. 83 (1927).

Railroad Commission v. Continental Oil Co., 157 S.W. 2d 695 (Tex. Civ. App. 9th 1941).

Republic Natural Gas Co. v. Oklahoma, 334 U.S. 62 (1948).

Saturn Oil and Gas Company v. Federal Power Commission, 250 F. 2d 61 (10th Cir. 1957).

S.E.C. v. Chenery Corp., 324 U.S. 194 (1947).

Shell Oil Company v. Federal Power Commission, 355 U.S. 930 (1958).

Shell Oil Company v. Federal Power Commission, 247 F. 2d 900 (5th Cir. 1957).

Smyth v. Ames, 169 U.S. 466 (1898).

State v. Consumers Gas Trust Co., 157 Ind. 345 (1901).

Stephens County v. Mid-Kansas Oil and Gas Co., 254 S.W. 290 (Tex. Sup. Ct. 1923).

Texas Railroad Commission v. Macmillan, 287 U.S. 576 (1932).

Texas Railroad Commission v. Shell Oil Corp., 206 S.W. 2d 235 (Tex. Sup. Ct. 1947).

Texoma Natural Gas Co. v. Railroad Commission of Texas, 59 F. 2d 750 (W.D. Tex. 1932).

Townsend v. State, 47 N.E. 19 (Sup. Ct. Ind. 1897).

United Fuel Gas Co. v. Hallanan, 257 U.S. 277 (1921).

United States v. E. I. duPont de Nemours & Co., 118 F. Supp. 41 (D. Del. 1953).

United States v. E. I. duPont de Nemours & Co., 351 U.S. 377 (1956).

U.S. Constitution.

Wabash, St. Louis and Pacific Railway Company v. Illinois, 118 U.S. 557 (1886).

West v. Kansas Natural Gas Company, 221 U.S. 229 (1911).

Western Distributing Co. v. Public Service Commission of Kansas, 285 U.S. 119 (1932).

Wisconsin v. Federal Power Commission, 83 S.Ct. 1266 (1963).

Wisconsin v. Phillips Petroleum Company, 205 F. 2d 706 (C.A.D.C. 1953).

APPENDIX

TABLE A

VALUE OF NATURAL GAS BY USES, UNITED STATES,
SELECTED YEARS, 1933-1960[a]
(MILLIONS OF DOLLARS)

Consumption Uses	1933	1938	1945	1948	1952	1954	1956	1960
Value at wellhead	97	114	191	333	624	883	1,084	1,790
Value in consumption	368	501	835	1,193	2,527	3,205	4,025	6,270
Domestic and commercial	252	329	513	727	1,641	2,072	2,592	4,000
Domestic	210	273	415	585	1,347	1,692	2,126	3,209
Commercial	43	56	98	142	294	378	465	791
Industrial	116	171	322	466	886	1,135	1,433	2,270
Field use	29	30	40	61	115	121	149	220
Carbon black manufacture	4	3	10	23	20	18	19	20
Other industrial uses (residual)	83	138	272	382	751	996	1,265	2,030

[a]Data taken from Minerals Yearbook, various years, and rounded to nearest million dollars.

TABLE B

QUANTITY OF NATURAL GAS MARKETED, SHIPPED INTERSTATE, AND IN PROVED RECOVERABLE RESERVES, FOR THE UNITED STATES, THE SOUTHWESTERN REGION, AND FIVE SOUTHWESTERN STATES, SELECTED YEARS, 1933-1960[a,b]
(BILLION CUBIC FEET)

Geographic Area	1933	1938	1945	1950	1952	1954	1956	1958	1960
United States									
Marketed production	1,556	2,296	3,918	6,282	8,013[e]	8,742[e]	10,082[e]	11,030[e]	12,771[e]
Interstate shipments	347	637	1,106	2,544[f]	3,794[g]	4,662[h]	5,628	6,342	7,544
Proved recoverable reserves	c	c	147,789	185,593	199,716	211,711	237,775	254,142	263,759
Southwestern Region									
Marketed production	c	1,555	2,862	5,017	6,711	7,428	8,717	9,649	11,139
Interstate shipments	232	427	873	2,222	3,409	4,319	5,090	5,678	6,735
Proved recoverable reserves	c	c	126,677	163,353	177,182	187,324	212,597	226,778	235,411
Kansas									
Marketed production	42	75	146	364	412	412	526	562	634
Interstate shipments	22	39	80	228	287	327	424	424	505
Proved recoverable reserves	c	c	13,251	13,791	14,194	15,758	17,566	20,234	19,620
Louisiana									
Marketed production	198	284	543	832	1,237	1,399	1,886	2,452	2,988
Interstate shipments	87	138	229	396	694	560	1,150	1,626	2,232
Proved recoverable reserves	c	c	19,849	28,533	31,452[d]	36,780[d]	45,054[d]	55,112[d]	63,386[d]

New Mexico									
Marketed production	c	51	105	213	359	449	626	761	799
Interstate shipments	6	19	36	87	203	325	448	573	615
Proved recoverable reserves	c	c	5,170	6,991	14,039	17,241	23,473	21,180	15,604
Oklahoma									
Marketed production	246	263	358	482	554	616	679	696	824
Interstate shipments	16	29	122	200	228	288	316	694	451
Proved recoverable reserves	c	c	10,080	11,634	11,765	12,396	13,775	15,207	17,311
Texas									
Marketed production	476	882	1,711	3,126	4,148	4,551	5,000	5,178	5,893
Interstate shipments	102	201	406	1,311	1,998	2,420	2,752	2,700	2,952
Proved recoverable reserves	c	c	78,307	102,904	105,733[d]	105,129[d]	112,729[d]	115,788[d]	119,489[d]

[a]Data taken from Minerals Yearbook, various years, and rounded to nearest billion cubic feet.

[b]Volumes of gas in reserve are reported at a pressure base of 14.65 pounds per square inch at a standard temperature of 60 F.

[c]Consistent data not available.

[d]Includes offshore reserves.

[e]Marketed production includes gas either sold or consumed by producer, including losses in transportation, amounts added to storage, and increases in gas in pipelines. Definition not given before 1952.

[f]Includes exports: 23 billion cubic feet to Mexico; 3 billion cubic feet to Canada.

[g]Includes exports: 23 billion cubic feet to Mexico; 6 billion cubic feet to Canada.

[h]Includes exports: 22 billion cubic feet to Mexico; 6 billion cubic feet to Canada.

TABLE C

MARKETED PRODUCTION AND CONSUMPTION OF NATURAL GAS BY STATES, 1933, 1938, 1946, 1954, AND 1960[a]
(BILLION CUBIC FEET)

State	1933		1938		1946		1954		1960	
	Production	Consumption	Production	Consumption	Production	Consumption	Production	Consumption	Production	Consumption
Alabama	. .	7.5	. .	14.8	. .	45.4	.1	139.6	.1	184.1
Alaska	b	b	. .	. .	. .	. .	. .	. .	.2	.2
Arizona	. .	2.5	. .	2.7	. .	24.2	. .	75.6	. .	135.5
Arkansas	8.3	22.8	11.3	34.8	45.2	87.7	33.5	192.4	55.5	216.5
California	259.8	259.8	315.2	315.2	488.0	487.9	507.3	934.0	517.5	1,311.3
Colorado	2.4	15.9	1.9	19.2	6.7	40.4	45.7	126.0	107.4	207.6
Connecticut	. .	. .	. .	. .	. .	. .	. .	11.4	. .	28.5
Delaware	. .	. .	. .	. .	. .	. .	. .	3.0	. .	9.0
District of Columbia	. .	2.0	. .	3.8	. .	7.4	. .	14.3	. .	18.1
Florida	. .	.5	. .	1.5	b	7.1	b	23.2	b	137.9
Georgia	. .	4.5	. .	14.8	. .	36.7	. .	132.1	. .	182.1
Idaho	. .	. .	. .	. .	. .	. .	. .	. .	. .	22.0
Illinois	1.6	33.3	1.2	66.5	17.2	124.3	9.5	391.4	11.7	536.5
Indiana	1.5	6.0	1.3	26.7	1.1	40.2	1.0	116.3	.3	212.9
Iowa	. .	11.4	. .	20.1	. .	33.2	. .	119.9	. .	187.1
Kansas	41.6	57.0	75.2	86.1	165.7	175.8	412.4	283.6	634.4	372.3
Kentucky	31.4	13.2	46.2	15.4	70.4	29.5	72.7	110.0	75.3	159.7
Louisiana	197.8	115.8	283.9	162.3	525.2	331.4	1,399.2	636.7	2,988.4	947.9
Maryland	. .	.7	. .	1.2	. .	2.8	1.4	35.0	4.1	64.9
Massachusetts	. .	. .	. .	. .	. .	. .	. .	35.5	. .	77.9
Michigan	1.5	1.5	10.2	24.7	20.9	69.3	7.0	188.9	20.8	368.5
Minnesota	. .	3.5	. .	14.6	. .	37.6	. .	115.1	. .	179.8
Mississippi	8.7	5.8	13.7	12.8	7.2	41.8	140.4	136.8	172.5	188.9
Missouri	.7	27.6	1.4	42.5	b	74.3	b	188.3	.1	261.4
Montana	14.4	12.2[d]	21.2	18.2[g]	30.7	28.2	30.3	40.6	33.4	54.6
Nebraska	. .	10.3	. .	17.5	. .	33.6	6.8	93.2	15.3	139.0
Nevada	. .	. .	. .	. .	. .	. .	. .	1.0	. .	12.4
New Hampshire	. .	. .	. .	. .	. .	. .	. .	1.1	. .	2.9
New Jersey	. .	. .	. .	. .	. .	. .	. .	65.7	. .	139.3

New Mexico	19.1	13.1	50.7	32.9	119.3[h]	85.7	449.3	177.2	798.9	266.4
New York	6.9	19.9	39.4	48.0	5.1	32.9	2.6	225.8	5.0	419.5
North Carolina	. .	. .	. .	. .	. .	. .	. .	9.4	. .	45.4
North Dakota	. .	1.0	.1	1.5	.3	2.5	1.1	4.8	19.5	17.3
Ohio	47.9	92.8	35.3	108.0	61.6	188.5	28.8	442.5	36.1	698.6
Oklahoma	245.8	242.5	263.2	244.2	381.0	246.0	616.4	328.0	824.3	383.0
Oregon	. .	. .	. .	. .	. .	. .	. .	. .	. .	30.9
Pennsylvania	63.6	73.6	76.5[e]	96.3	92.4	158.6	146.0	353.2	113.9	520.8
Rhode Island	. .	. .	. .	. .	. .	. .	. .	4.4	. .	11.8
South Carolina	. .	. .	. .	. .	. .	. .	...	16.6	. .	58.5
South Dakota	b	3.3	10.0	5.4	. .	7.5	b	15.6	. .	24.5
Tennessee	b	7.4	b	14.0	b	24.3	.1	114.9	.1	155.6
Texas	475.7[c]	412.4	882.5[f]	729.6	1,776.1[j]	1,366.5	4,551.2	2,198.2	5,892.7	2,981.2
Utah	b	5.9	4.3	11.7	4.3	15.7	16.0	41.1	51.0	75.7
Virginia	. .	.2	. .	.6	b	2.1	1.4	35.6	2.2	66.2
Washington	.1	.1	.1	.1	. .	. .	. .	. .	. .	64.9
West Virginia	100.7	42.2	134.3	57.5	179.0	100.7	191.6	138.8	208.8	180.0
Wisconsin	. .	. .	. .	. .	. .	.1	. .	39.3	. .	90.6
Wyoming	25.8	3.4	26.7	18.7	33.3	23.1	71.1	36.7	186.6	59.6
Total	1,555.5	1,553.4	2,295.6	2,294.1	4,030.6	4,013.0	8,742.5	8,402.9	12,771.0	12,509.4

[a]Data taken from Minerals Yearbook, various years, and rounded to nearest one hundred million cubic feet. Production comprises gas either sold or consumed by producer, including losses in transmission, quantities added to storage, and increases of gas in pipelines. It includes deliveries in other states. Consumption includes volume of natural gas which is distributed as a component of mixed gas, including receipts from other states.

[b]Less than 50 million cubic feet.

[c]Includes 2,089 million cubic feet piped to Mexico.

[d]Includes 83 million cubic feet piped from Canada.

[e]Includes 60 million cubic feet piped to Canada.

[f]Includes 911 million cubic feet piped to Mexico.

[g]Includes 372 million cubic feet piped from Canada.

[h]Includes 3,315 million cubic feet piped to Mexico.

[i]Includes 180 million cubic feet piped to Canada.

[j]Includes 14,160 million cubic feet piped to Mexico.

TABLE D

SOURCES AND USES OF NATURAL GAS, THE UNITED STATES INDUSTRY, SELECTED YEARS, 1929-1960[a]
(BILLION CUBIC FEET)

Item	1929	1933	1938	1945	1948	1952	1954	1956	1960
Proved recoverable reserves	b	b	b	147,789	173,869	199,716	211,711	237,775	263,759
Gross withdrawals	b	b	3,048	5,902	7,178	10,273	10,985	12,373	15,088
From gas wells	b	b	1,567	3,888	4,589	6,839	7,466	8,306	10,853
From oil wells	b	b	1,481	2,014	2,590	3,433	3,519	4,066	4,234
Disposition of gas									
Marketed production	b	b	2,296[c]	3,919	5,148	8,014	8,742	10,082	12,771
Repressuring	b	b	102	1,062	1,221	1,411	1,519	1,427	1,754
Vented and wasted	b	b	636[d]	896	810	849	724[e]	861	563[f]
Consumption	b	1,553	2,294	3,900	4,945	7,614	8,373	9,707	12,509
Residential	360[g]	283	368	607	896	1,622	1,894	2,328	3,103
Commercial	b	86	114	230	323	516	585	717	1,020
Industrial	1,557	1,184	1,812	3,063	3,726	5,476	5,924	6,662	8,386
Selected Industrial uses									
Field use	705	494	659	917	1,022	1,484	1,457	1,421[h]	1,778
Carbon black manufacture	261	187	325	432	441	368	251	243	198
Fuel use (including electric utility)	145	88	153	1,714	2,224	3,624[i]	4,216[i]	4,999[i]	6,409
Electric utility plants	113	103	171	326	478[j]	910[j]	1,166[j]	1,239[j]	1,725[j]

[a]Data taken from Minerals Yearbook, various years, and rounded to nearest billion cubic feet.

[b]Consistent data not available.

[c]Includes quantities used in repressuring, stored in ground, lost and wasted.

[d]Includes gas blown to the air, shrinkage at natural gas plants and transmission losses but not direct waste on producing properties.

[e]Includes gas blown to air but does not include direct waste on producing properties except where data are available.

[f]Does not include undisclosed figures.

[g]Includes commercial, separate figures not available.

[h]9,883 million cubic feet included in field use to avoid disclosure; included in carbon black total.

[i]Partly estimated: Includes direct waste on producing properties and residue blown to the air.

[j]Figures include some manufactured gas. Natural gas portion is included in "other industrial fuel."

TABLE E

QUANTITY AND PRICE OF PETROLEUM DISCOVERED, PRODUCED, AND ADDED TO RESERVES, 1920, 1925, AND 1930-1960

	Quantity in Thousands of Barrels[a]			Average Price Per Barrel of Crude Oil at the Well[d]				
Years	Physical Discovery[b]	Production	Amount Added to Reserves[c]	United States	Texas	California	Oklahoma	Louisiana
1920	942,929	442,929	500,000	$3.07	$3.24	$1.73	$3.36	$3.15
1925	1,763,743	765,743	1,000,000	1.68	1.81	1.42	1.97	1.60
1930	1,298,011	898,011	400,000	1.19	.99	1.20	1.29	1.12
1931	251,081	851,081	(600,000)	.65	.51	.72	.66	.65
1932	85,159	785,159	(700,000)	.87	.83	.81	.90	.85
1933	605,656	905,656	(300,000)	.67	.56	.83	.66	.61
1934	1,085,065	908,065	100,000	1.00	.95	.92	1.02	.97
1935	1,219,596	996,596	223,000	.97	.94	.82	1.02	.99
1936	1,763,087	1,099,687	663,400	1.09	1.05	1.01	1.12	1.06
1937	3,721,532	1,277,664	2,443,868	1.18	1.16	1.02	1.24	1.21
1938	3,054,064	1,213,186	1,840,878	1.13	1.13	1.03	1.20	1.16
1939	2,399,122	1,264,256	1,134,866	1.02	.99	1.02	1.04	1.05
1940	1,893,350	1,351,847	541,503	1.02	1.00	.97	1.04	1.04
1941	1,968,963	1,404,182	564,781	1.14	1.12	1.04	1.13	1.14
1942	1,878,976	1,385,479	493,497	1.19	1.17	1.03	1.19	1.19
1943	1,484,786	1,503,427	(18,641)	1.20	1.21	1.05	1.19	1.22
1944	2,067,500	1,678,421	389,079	1.21	1.21	1.06	1.23	1.22
1945	2,110,299[e]	1,736,717[e]	373,582[e]	1.22	1.21	1.06	1.27	1.23
1946	2,658,062	1,726,348	931,714	1.41	1.41	1.23	1.44	1.45
1947	2,464,570	1,850,445	614,125	1.93	1.95	1.72	1.92	2.01
1948	3,795,207	2,002,448	1,792,759	2.60	2.61	2.42	2.58	2.68
1949	3,187,845	1,818,800	1,369,045	2.54	2.59	2.26	2.56	2.65

1950	2,562,685	1,943,776	618,909	2.51	2.59	2.16	2.57	2.65
1951	4,413,954	2,214,321	2,199,633	2.53	3.76	2.54	2.57	2.65
1952	2,749,288	2,256,765	492,523	2.53	3.76	2.55	2.56	2.64
1953	3,296,130	2,311,856	984,274	2.68	2.73	2.49	2.56	2.81
1954	2,873,037	2,257,119	615,918	2.78	2.84	2.55	2.70	2.93
1955	2,870,724	2,419,300	451,424	2.77	2.84	2.50	2.79	2.93
1956	2,974,336	2,551,857	422,479	2.79	2.83	2.62	2.78	2.93
1957	2,424,800	2,559,044	(134,244)	3.09	3.11	3.05	3.03	3.23
1958	2,608,242	2,372,730	295,512	3.01	3.06	2.90	2.96	3.26
1959	3,666,745	2,483,315	1,183,436	2.90	2.98	2.55	2.92	3.16
1960	2,365,328	2,471,464	(106,142)	2.88	2.96	2.46	2.92	3.14

[a]Data for 1920-1957 from American Petroleum Institute, Petroleum Facts and Figures, Centennial Edition, 1959. (New York: American Petroleum Institute, 1959), p. 62. Sources cited were American Petroleum Institute for 1937-1957 data and Bureau of Mines for data prior to 1937. The series for production differed slightly in the two sources. Data for 1958-1960 from American Petroleum Institute, Petroleum Facts and Figures, 1961 (New York: American Petroleum Institute, 1961), p. 46, citing the American Petroleum Institute.

[b]Includes reserves added through discoveries of new fields or new pools in old fields as well as revision of previous estimates and extensions to new fields.

[c]Amount added to reserves calculated as the difference between physical discovery and production for each year. Difference shown in parentheses when production exceeded discoveries.

[d]Data for 1920-1958 from American Petroleum Institute, Petroleum Facts and Figures: Centennial Edition, 1959 (New York: American Petroleum Institute, 1959), pp. 46-47, citing Bureau of Mines. Data for 1958-1960 from American Petroleum Institute, Petroleum Facts and Figures, 1961 (New York: American Petroleum Institute, 1961), p. 39, citing the Bureau of Mines. Data for 1960 preliminary; all others final. Prices reported are average prices for field-run crude produced within the geographic areas noted. As such, prices reflected other changed conditions as well as price trends.

[e]Beginning with 1946, only crude oil is included. Prior to 1946 some condensate was included.

TABLE F

FREQUENCY OF MONTH TO MONTH CHANGES IN CRUDE OIL PRICES, NEGLECTING SIGN, JANUARY, 1913 THROUGH SEPTEMBER, 1933 AND OCTOBER, 1933 THROUGH DECEMBER, 1960 IN DOLLARS PER BARREL[a]

Month to Month Change[b]	January, 1913 through September, 1933		October, 1933 through December, 1960[c]	
	Frequency	Total Change	Frequency	Total Change
.00	176	.00	260	.00
.02	1	.02	0	.00
.03	0	.00	1	.03
.04	1	.04	0	.00
.05	4	.20	1	.05
.07	0	.00	1	.07
.08	1	.08	0	.00
.09	1	.09	0	.00
.10	6	.60	4	.40
.12	0	.00	1	.12
.15	5	.75	0	.00
.16	1	.16	0	.00
.19	2	.38	0	.00
.20	3	.60	2	.40
.23	1	.23	0	.00
.25	17	4.25	4	1.00
.26	1	.26	0	.00
.28	1	.28	0	.00
.30	11	3.30	0	.00
.34	1	.34	0	.00
.35	2	.70	0	.00
.36	1	.36	0	.00
.39	2	.78	0	.00
.40	1	.40	0	.00
.45	1	.45	0	.00
.50	5	2.50	1	.50
.60	1	.60	0	.00
.75	1	.75	0	.00
1.00	1	1.00	0	.00
Total	248	19.12	275	2.57

[a]Observations for 1913-1958 taken from data found in American Petroleum Institute, Petroleum Facts and Figures, Centennial Edition, 1959 (New York: American Petroleum Institute, 1959), p. 375. Authorities cited: U.S. Geological Survey, Platt's Oil Price Handbook and

TABLE F - Continued

Oilmanac. Data for 1959-1960 from American Petroleum Institute, Petroleum Facts and Figures, 1961 Edition (New York: American Petroleum Institute, 1961), p. 226. Authority cited: Platt's Oil Price Handbook and Oilmanac. The Centennial Edition refers to "Oklahoma-Kansas 36-degree to 36.9-degree gravity crude." The 1961 Edition refers to "Oklahoma 36-degree to 36.9-degree gravity crude," but the same prices held in 1951 and 1958, for which references were available from both sources, and therefore the difference in definition apparently did not upset the comparability of the series.

[b]Changes with no observations either period were omitted.

[c]The period of stability during World War II, from December, 1942, through February, 1946, was ignored to eliminate the effect of direct price regulation.

TABLE G

VALUE OF NATURAL GAS AT WELLHEAD AND IN CONSUMPTION, BY STATES, 1933, 1938, 1946, 1954, AND 1960[a]
(MILLIONS OF DOLLARS)

State	1933		1938		1946		1954		1960	
	Well-head	Consump-tion	Well-head	Consump-tion	Well-head	Consump-tion	Well-head	Consump-tion	Well-head	Consump-tion
Alabama	. .	2.2	. .	3.9	. .	10.2	b	48.9	b	96.4
Alaska	b	b	. .	. .	. .	. .	. .	. .	b	b
Arizona	. .	.6	. .	3.8	. .	7.3	. .	27.5	. .	57.5
Arkansas	.5	5.0	.5	6.7	1.1	12.1	1.8	37.0	6.6	88.9
California	16.7	74.5	21.8	88.2	36.1	143.8	104.5	377.2	138.2	729.4
Colorado	.1	5.5	.1	7.0	.3	12.4	4.0	42.1	12.8	78.5
Connecticut	. .	. .	. .	. .	. .	. .	. .	25.8	. .	43.0
Delaware	. .	. .	. .	. .	. .	. .	. .	4.0	. .	9.8
District of Columbia	. .	1.6	. .	2.8	. .	5.2	. .	18.7	. .	26.9
Florida	. .	.2	. .	.4	b	1.4	b	4.8	b	69.7
Georgia	. .	3.0	. .	5.7	. .	12.8	. .	48.3	. .	111.7
Idaho	. .	. .	. .	. .	. .	. .	. .	. .	. .	11.8
Illinois	.1	26.8	b	37.0	1.0	54.9	1.3	213.4	1.5	401.6
Indiana	.4	2.6	.2	8.4	.1	20.2	b	76.1	.1	133.2
Iowa	. .	3.5	. .	7.3	. .	12.8	. .	52.4	. .	105.2
Kansas	2.5	15.1	3.2	19.0	8.3	32.9	43.7	73.6	74.2	114.4
Kentucky	4.0	5.8	5.6	6.8	10.4	12.5	16.6	45.0	18.4	88.8
Louisiana	6.1	12.5	9.7	19.9	18.6	32.3	124.5	98.4	511.0	215.3
Maryland	. .	.5	. .	.9	. .	2.1	.3	43.4	1.1	88.6
Massachusetts	. .	. .	1.0	. .	. .	. .	. .	64.2	. .	132.4
Michigan	.2	.6	. .	22.8	2.7	48.8	1.3	155.6	4.4	294.7
Minnesota	. .	1.0	. .	7.0	. .	13.0	. .	59.4	. .	118.2
Mississippi	.4	1.8	.7	3.5	.3	10.0	11.7	33.0	32.4	68.3
Missouri	.1	12.5	.1	6.1	b	31.0	b	87.8	b	147.4
Montana	.6	3.4	.9	4.9	1.4	7.7	2.1	15.1	2.4	22.7
Nebraska	. .	3.6	. .	6.2	. .	11.2	1.0	40.0	2.7	66.1
Nevada	. .	. .	. .	. .	. .	. .	. .	1.0	. .	9.0

New Hampshire	. .	. .	. .	. .	. .	. .	. .	2.2	. .	4.7
New Jersey	. .	. .	. .	. .	. .	. .	. .	93.5	. .	205.6
New Mexico	.5	1.5	.8	3.5	1.7	7.5	35.0	25.9	85.5	53.4
New York	1.9	13.2	5.7	20.3	1.4	24.7	1.0	287.1	1.5	532.6
North Carolina	. .	. .	. .	. .	b	. .	. .	7.0	. .	33.5
North Dakota	. .	.4	b	.6	b	1.0	.1	2.4	2.2	6.8
Ohio	8.2	48.7	5.9	53.9	11.3	98.4	6.1	265.8	8.5	491.6
Oklahoma	9.5	20.3	5.2	20.1	12.3	29.7	43.1	64.4	98.1	100.1
Oregon	. .	. .	. .	. .	. .	. .	. .	. .	. .	23.0
Pennsylvania	15.1	34.2	13.9	41.0	23.5	69.3	43.6	239.2	36.2	418.0
Rhode Island	. .	. .	. .	. .	. .	. .	. .	12.3	. .	19.2
South Carolina	. .	. .	. .	. .	b	. .	. .	10.6	. .	34.1
South Dakota	b	1.2	b	1.8	. .	2.7	b	7.4	. .	14.8
Tennessee	b	2.8	b	4.4	b	8.0	b	46.5	b	81.3
Texas	11.3	46.1	19.8	55.4	53.6	107.7	386.9	296.3	665.9	577.6
Utah	b	1.6	.1	2.6	.2	5.0	2.3	16.2	9.2	33.8
Virginia	. .	.2	. .	.6	b	2.0	.4	33.7	.6	68.4
Washington	b	.1	b	.1	. .	. .	. .	. .	. .	40.4
West Virginia	18.1	43.7	17.5	15.3	26.7	27.5	45.6	49.8	54.7	97.1
Wisconsin	. .	. .	. .	. .	. .	.1	. .	44.0	. .	89.6
Wyoming	.8	2.0	.8	2.8	1.3	4.2	6.0	8.7	21.8	14.6
Total	97.1	368.1	113.6	500.6	212.3	882.4	775.0	3,205.4	1,790.0	6,269.7

[a]Data taken from Minerals Yearbook, various years, and rounded to nearest $100,000. All consumption figures include natural gas mixed with manufactured gas.

[b]Less than $50,000.

TABLE H

AVERAGE VALUE OF ONE THOUSAND CUBIC FEET OF NATURAL GAS IN THE UNITED STATES, SELECTED YEARS, 1929-1960[a]
(CENTS)

Consumption Uses	1929	1933	1938	1945	1948	1952	1954	1956	1960
Value at wellhead	8.2	6.2	4.9	4.9	6.5	7.8	10.1	10.8	14.0
Value in consumption									
Domestic and commercial	62.0	68.4	68.3	61.2	59.6	76.8	83.5	85.1	97.0
Domestic	b	74.0	74.2	68.3	65.3	83.1	89.3	91.3	103.4
Commercial	b	49.8	49.2	42.4	44.0	57.0	64.7	64.9	77.5
Industrial	b	9.8	9.4	10.5	11.3	16.2	19.2	21.5	27.1
Field use	b	b	b	b	b	b	b	10.5	12.4
Carbon black manufacture	b	2.0	0.9	2.3	4.7	5.5	6.9	7.7	10.0

[a]Data taken from Minerals Yearbook, various years. "Natural gas" includes the natural gas which is distributed as a component of mixed gas.

[b]Consistent data not available.